U.S. Department of Justice
Bureau of Alcohol, Tobacco, Firearms and Explosives

Firearms Technology Criminal Branch
Report of Technical Examination

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UI#: 765040-23-0011

RE: Rare Breed Triggers

FTCB#: 2023-724-ALC
326038

Date Exhibit Received: 4/20/2023

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Type of Examination Requested:

Test, Examination, Classification

These findings are founded on my experience and my review of pertinent laws, materials, and records. I reserve the right to amend or supplement this report.

Exhibit:

42. Rare Breed Triggers, model FRT-15, no serial number (suspected machinegun).

Pertinent Authority:

Title 28 of the United States Code (U.S.C.) provides the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) the authority to investigate criminal and regulatory violations of Federal firearms law at the direction of the Attorney General. Under the corresponding Federal regulation at 28 C.F.R. 0.130 the Attorney General provides ATF with the authority to investigate, administer, and enforce the laws related to firearms, in relevant part, under 18 U.S.C. Chapter 44 (Gun Control Act) and 26 U.S.C. Chapter 53 (National Firearms Act). Pursuant to the aforementioned statutory and regulatory authority, the ATF Firearms and Ammunition Technology Division (FATD) provides expert technical support on firearms and ammunition to federal, state, and local law enforcement agencies regarding the Gun Control Act and the National Firearms Act.

The Gun Control Act (GCA), 18 U.S.C. § 921(a)(24), defines the term "**machinegun**" as having: "*... the meaning given such term in section 5845(b) of the National Firearms Act (26 U.S.C. 5845(b)).*"

The National Firearms Act (NFA), 26 U.S.C. § 5845(a), defines "**firearm**" to include: "*...(1) a shotgun having a barrel or barrels of less than 18 inches in length; (2) a weapon made from a shotgun if such weapon as modified has an overall length of less than 26 inches or a barrel or barrels of less than 18 inches in length; (3) a rifle having a barrel or barrels of less than 16 inches in length (4) a weapon made from a rifle if such weapon as modified has an overall length of less than 26 inches or a barrel or barrels of less than 16 inches in length;*

(5) any other weapon, as defined, as defined in subsection (e); ***(6) a machinegun****; (7) any silencer (as defined in 18 U.S.C. § 921); and (8) a destructive device. The term "firearm" shall not include an antique firearm or any device (other than a machinegun or destructive device) which, although designed as a weapon, the…[Attorney General]…finds by reason of the date of its manufacture, value, design and other characteristics is primarily a collector's item and is not likely to be used as a weapon*."

The NFA, 26 U.S.C. § 5845(b), defines "**machinegun**" as: "*...**any weapon which shoots, is designed to shoot, or can be readily restored to shoot, automatically more than one shot, without manual reloading, by a single function of the trigger**. The term shall also include the frame or receiver of any such weapon, any part designed and intended solely and exclusively, or **combination of parts designed and intended, for use in converting a weapon into a machinegun**, and any combination of parts from which a machinegun can be assembled if such parts are in the possession or under the control of a person.*" (emphasis added)

The NFA, 26 U.S.C. § 5842, "**Identification of firearms**," states: "*... (a) Identification of firearms other than destructive devices. - Each manufacturer and importer and anyone making a firearm shall identify each firearm, other than a destructive device, manufactured, imported, or made by a serial number which may not be readily removed, obliterated, or altered, the name of the manufacturer, importer, or maker, and such other identification as the ... [Attorney General]… may by regulations prescribe. (b) Firearms without serial number. - Any person who possesses a firearm, other than a destructive device, which does not bear the serial number and other information required by subsection (a) of this section shall identify the firearm with a serial number assigned by the ... [Attorney General]… and any other information the…[latter]… may by regulations prescribe.*"

Finally, 27 CFR §§ 478.11 and 479.11, further define the term "**machinegun**" to include two sentences at the end of the statutory definition to read as follows: "*...For purposes of this definition, **the term ''automatically'' as it modifies ''shoots, is designed to shoot, or can be readily restored to shoot,'' means functioning as the result of a self-acting or self-regulating mechanism that allows the firing of multiple rounds through a single function of the trigger; and ''single function of the trigger'' means a single pull of the trigger and analogous motions**. The term ''machine gun'' includes a bump-stock-type device, i.e., a device that allows a semi-automatic firearm to shoot more than one shot with a single pull of the trigger by harnessing the recoil energy of the semiautomatic firearm to which it is affixed so that the trigger resets and continues firing without additional physical manipulation of the trigger by the shooter.*" (emphasis added)

Findings:

As background, Federal law defines "machinegun," in relevant part, as "any weapon which shoots, is designed to shoot, or can be readily restored to shoot, automatically more than one shot, without manual reloading, by a single function of the trigger" as well as a "combination of parts designed and intended, for use in converting a weapon into a machinegun." Legislative history for the NFA indicates that the drafters equated a "single function of the trigger" with "single pull of the trigger." National Firearms Act: Hearings Before the Comm. On Ways and Means, House of Representatives, Second Session on H.R. 9066, 73rd Cong., at 40 (1934). ATF has long held that a single function of the trigger is a "single pull" or alternatively, a single release of a trigger. Therefore, a firearm is not a machinegun if a projectile is expelled when the trigger is pulled, and a second projectile is expelled when the trigger is released.

Final rule 2018R-22F, which further defines the term "**machinegun**," became effective on March 26, 2019. The final ruling clarifies the term "***automatically***" (found in the NFA, 26 U.S.C. § 5845(b)) as it modifies "shoots, is designed to shoot, or can be readily restored to shoot," means functioning as the result of *a self-acting or self-regulating mechanism* that allows the firing of multiple rounds through a single function of the trigger. Additionally, the rule states *"**single function of the trigger**" means a single pull of the trigger and analogous motions* (27 CFR §§ 478.11 and 479.11). However, the term "trigger" is not defined by Federal law.

The term "trigger" is generally applied by the firearm industry to the mechanism that causes the firing sequence to begin, usually by releasing an energized component. The term "trigger" regarding Federal firearm laws, particularly the GCA and NFA, is context specific. Simply put, the "trigger" initiates the firing sequence.

Federal courts have noted that automatically means that the weapon "fires repeatedly with a single pull of the trigger." *Staples v. United States*, 511 U.S. 600, 602 n. 1 (1994). "That is, once its trigger is depressed, the weapon will automatically continue to fire until its trigger is released, or the ammunition is exhausted." *Id.* Courts have specifically affirmed ATF's interpretation that a single act of the shooter to initiate the firing sequence is a single function of the trigger. *Akins v. United States*, 312 F. App'x 197, 200 (11th Cir. 2009); *Freedom Ordnance Mfg., Inc. v. Brandon*, No. 3:16-cv-00243-RLY-MPB (S.D. Ind. Mar. 27, 2018). *United States v. Fleischli*, 305 F.3d 643, 655 (7th Cir. 2002) (in which electronic switch was the trigger when it served to initiate the firing sequence and the minigun continued to fire until the switch was turned off or the ammunition was exhausted). In the *Freedom Ordnance* case, the United States District Court of Indiana held that ATF was not arbitrary and capricious in the classification of an "electronic reset assist device" as a machinegun even though the firearm's trigger reset before each shot by pushing the trigger forward. *Freedom Ordnance Mfg., Inc*, No. 3:16-cv-00243-RLY-MPB. In these cases, a firearm is a machinegun when it uses an internal mechanism or operation that automatically forces the trigger forward allowing the weapon to fire more than one shot by a continuous pull of the trigger.

ATF has a long history of examining devices which manipulate the trigger of a firearm. As part of the examination process, I researched other trigger devices, some of which ATF has previously examined and classified and some of which it has not. This was completed to research the classification history of devices which may or may not have worked similarly and to maintain consistency in those classifications. These devices include, but are not limited to, the following:

- Rare Breed Triggers, model FRT-15 (classified as a machinegun, 2021 #317388)
- [redacted] model AR1 (classified as a machinegun, 2018 #307385)
- Wide Open Enterprises, model Wide Open Trigger (classified as a machinegun, 2021 #317970)
- Flex-Fire Technology
- [redacted] "trigger reset device" (classified as a machinegun, 2017 #307369)
- [redacted] (classified as a machinegun, 2006 #2006-1060)
- [redacted] "forced reset trigger" (classified as a machinegun, 2004 #254498)
- Tac-Con 3MR (not classified as a machinegun, 2013 #301071)
- FosTech ECHO (not classified as a machinegun, 2013 #301397)
- [redacted] E-RAD (classified as a machinegun, 2016 #304847)
- [redacted] trigger device (classified as a machinegun, 1994 #46717)

Exhibit 42 is a Rare Breed Triggers, model FRT-15, "forced reset trigger" designed to allow drop in installation into AR15-type firearms. The Exhibit is not marked with a serial number.

Exhibit 42 bears the following markings on the right side of its aluminum housing:

- **RARE BREED**
- **-TRIGGERS-**
- **US PAT. 10514223**

I manually function tested the device and noted that in order to pull the trigger, I had to manually disengage the locking bar. In order to further examine the component parts of the Exhibit 42 device, I disassembled the device utilizing a common pin punch and hammer in approximately one minute.

Exhibit 42 is comprised of the following individual component parts:

- One aluminum housing
- One hammer
- One hammer spring
- Two tubular pins
- One trigger
- One trigger spring
- One "locking bar"
- One solid pin
- One locking bar spring
- Two pins with internal threads at both ends
- Four hex head screws with exterior threads

The hammer of the Exhibit 42 device is designed in such a way that it only incorporates one sear surface. This is different from a standard semiautomatic AR15-type hammer, which incorporates two sear surfaces. The second sear surface in a semiautomatic AR15-type firearm is designed to interact with the disconnector. A disconnector can be described as the part in a semiautomatic firearm that prevents the continued firing of the gun while the trigger remains depressed. Simply put, the disconnector holds the gun at full cock as long as the trigger is held back.

In a M16-type machinegun, the hammer incorporates three sear surfaces. The first two are identical to the semiautomatic hammer in design and location. The addition of the third surface allows the hammer to engage the automatic sear. With an M16-type machinegun (selector in the "automatic" position) the first two sear surfaces are taken completely out of "play" once the trigger is pulled, and only the automatic sear retains the hammer. Similar to the relationship between the locking bar of the FRT-15, once the bolt has completed its firing cycle (described in detail below), the M16-type bolt strikes the automatic sear, disengaging it.

I researched U.S. Patent No.: 10,514,223 B1, seeing that it is marked on the side of the Exhibit. This patent, which was applied for by the manufacturer of the AR1 trigger device, Wolf Tactical LLC (now assigned to Rare Breed Firearms), outlines the design and function of a "firearm trigger mechanism." The patent describes a "drop-in" trigger mechanism for an AR15-type firearm, as discussed below. This patent depicts a device which is virtually identical in geometry, but functions in the same manner as the Rare Breed Firearms FRT-15.

U.S. Patent Number 10,514,223 B1 includes illustrations which closely parallel the Exhibit 42 Rare Breed FRT-15 device in its "drop-in" concept, though having differing geometry in its component parts (see attached patent) such as the hammer, trigger, and "locking bar." The device is designed to allow "drop-in" installation into an AR15-type firearm and function in conjunction with an H3 weight buffer and M16-type machinegun bolt carrier rather than a standard semiautomatic AR15-type bolt carrier. The M16-type bolt carrier incorporates a contact surface that is unnecessary on AR15-type semiautomatic firearms because this surface is designed to "trip" the automatic sear in standard M16-type machineguns. This surface is utilized to similarly "trip" the "locking bar" in FRT-15 equipped AR15-type firearms during the operating cycle. The M16-type bolt carrier interacts with the "locking bar" in the same manner that it interacts with an automatic sear. Indeed, it is telling that in the attached patent, Wolf Tactical LLC Patent.: U.S. 10,514,223 B1, includes the following in 4, 50, and 55 (emphasis in red added):

> *The bolt carrier assembly **52** used with the embodiments of this invention can be an ordinary (mil-spec) M16-pattern bolt carrier assembly, whether operated by direct impingement or a gas piston system, that has a bottom cut position to engage an auto sear in a fully automatic configuration. The bottom cut creates an engagement surface **54** in the tail portion **56** of the bolt carrier body **58**. This is distinct from a modified AR15 bolt carrier that is further cut-away so that engagement with an auto sear is impossible.*

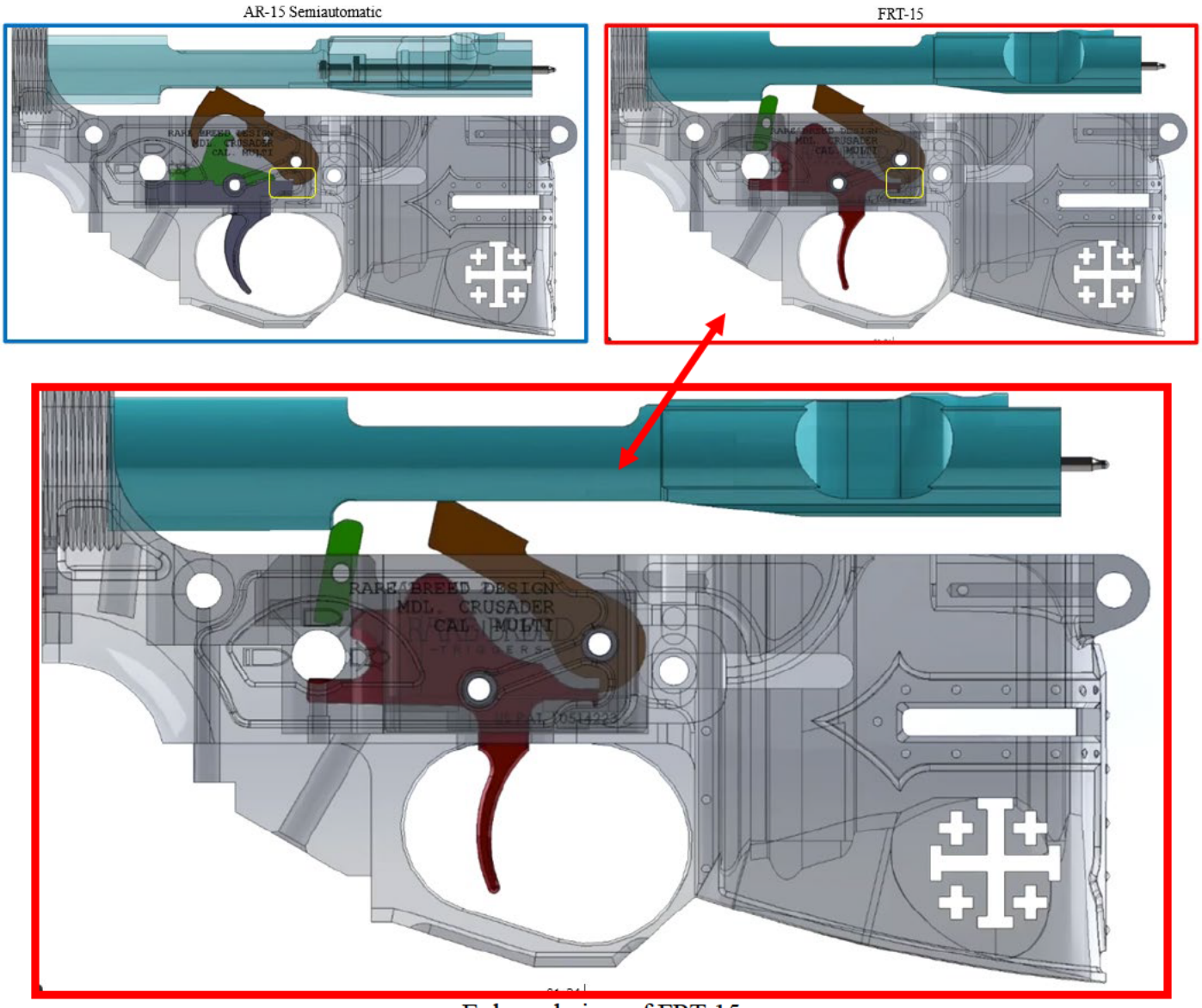
U.S. Patent No.: 10,514,223 B1 also includes the following explanation revealing that the "locking bar" serves the same function as an automatic sear in a typical machinegun – to capture a fire control component until the additional surface on an M16-type bolt carrier contacts it and releases the fire control component to automatically fire a subsequent shot (emphasis added in red).

> *(57) Abstract*
>
> *The locking bar is pivotally mounted in a frame and spring biased toward a first position in which it mechanically blocks the trigger member against the spring bias to a second position when contacted by the bolt carrier reaching a substantially in-battery position, allowing the trigger member to be moved by an external force to a released position.*
> ...
>
> *4 (65) – 5 (2)*
>
> *An upper end of the locking bar **62** extends above the upper edge of housing **12** and lower receiver **50** to be engaged by the engagement surface **54** of the bolt carrier body **58** when the bolt carrier assembly is at or near its in-battery position.*

This *"external force"* allowing the trigger member to be moved to a released position, is merely the continuous pressure applied to the trigger during the initial single continuous function (pull) of the trigger. With both an FRT-15 equipped AR15-type firearm, and an M16-type machinegun (with the selector set in its "automatic" position), the shooter maintains a constant rearward pull of the trigger to fire subsequent shots with a single function (pull) of the trigger, through both the M16-type machinegun and FRT-15 equipped AR15-types self-acting or self-regulating mechanisms during the operating cycle of the firearms.

Basic operation of the Rare Breed Triggers FRT-15 device installed within an AR15-type firearm having a M16-type machinegun bolt carrier is as follows (images pulled from a video animation previously available on Rare Breed Triggers website, showing comparative views of the semiautomatic AR15-type and FRT-15 mechanisms, with added ATF text and highlights):

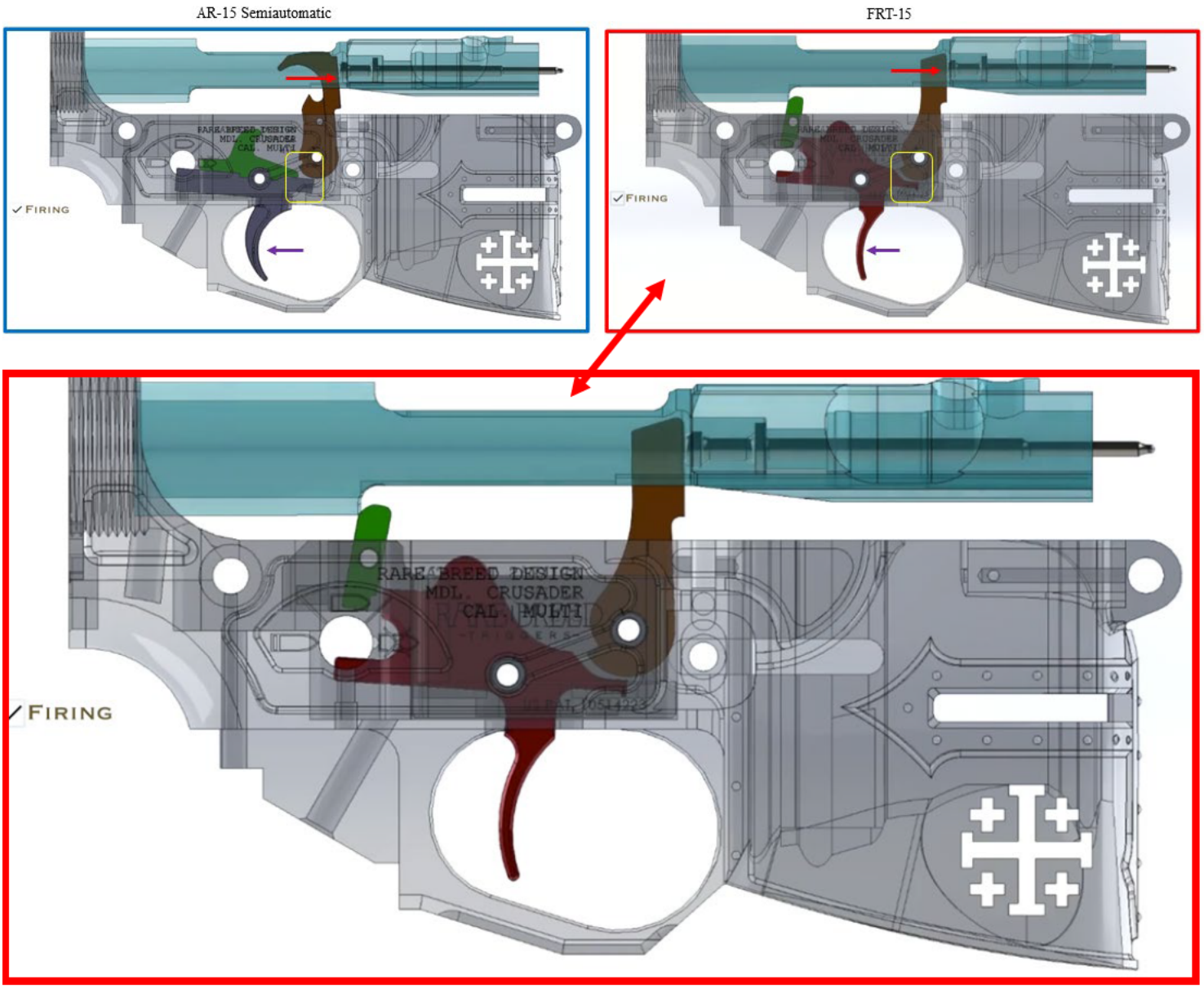
- Image of semiautomatic AR15-type (left) and FRT-15 equipped firearm (right) with both firearms ready to fire with the hammer in a "cocked" position being held by the sear surface on the front of the trigger (yellow box).



Enlarged view of FRT-15

Firing:

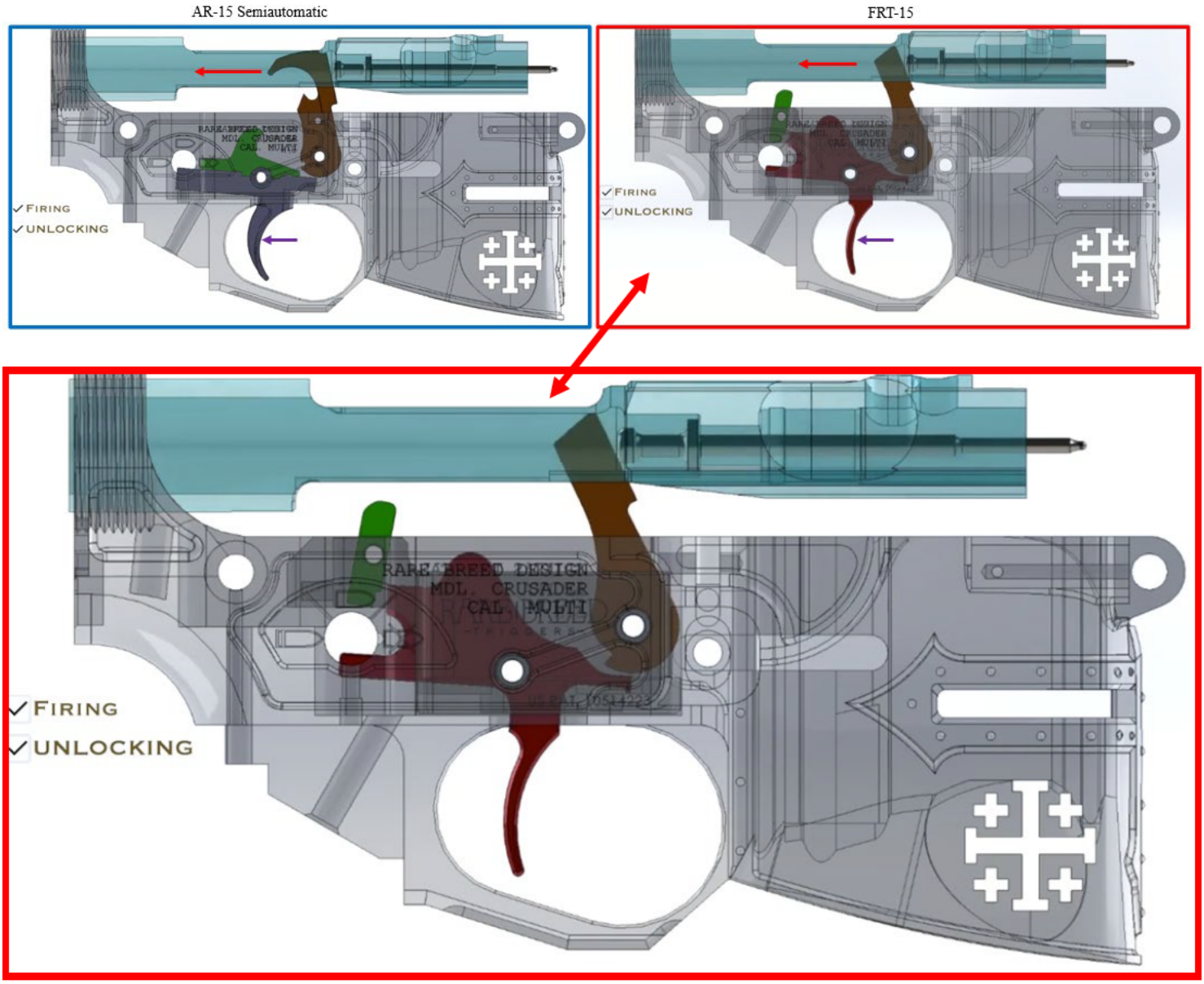
- Rearward pressure is applied to "pull" the trigger, thus releasing the hammer, which falls impacting the firing pin and discharging the primer, which then ignites the propellant powder to accelerate the projectile (bullet) down the rifled bore.



Enlarged view of FRT-15

Unlocking:

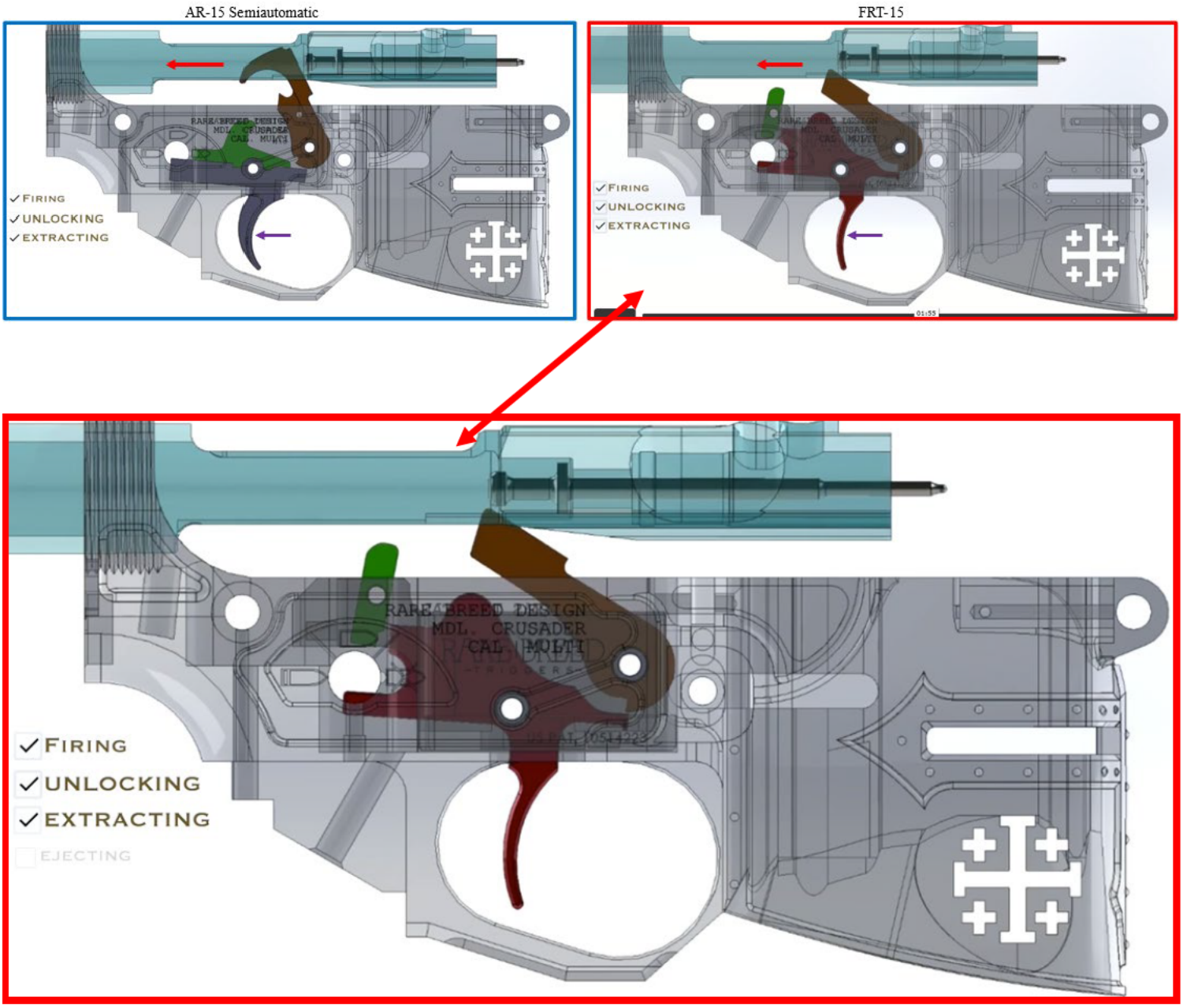
- As the projectile moves past the gas port, a quantity of the gas is bled off through the gas port to the gas tube, and subsequent bolt carrier key into a cylindrical section in the bolt carrier where it expands and drives the bolt carrier rearward. Note that this happens **rapidly** while rearward "pull" pressure from the trigger pull is generally maintained on the trigger. During the initial rearward travel of the carrier assembly, the bolt is rotated by the cam pin, acted on by the bolt carrier cam slot. This rotation disengages the bolt lugs from the barrel extension lugs so the bolt is unlocked. The bolt carrier group then continues rearward with the unlocked bolt assembly which starts to act upon the hammer.



Enlarged view of FRT-15

Extracting:

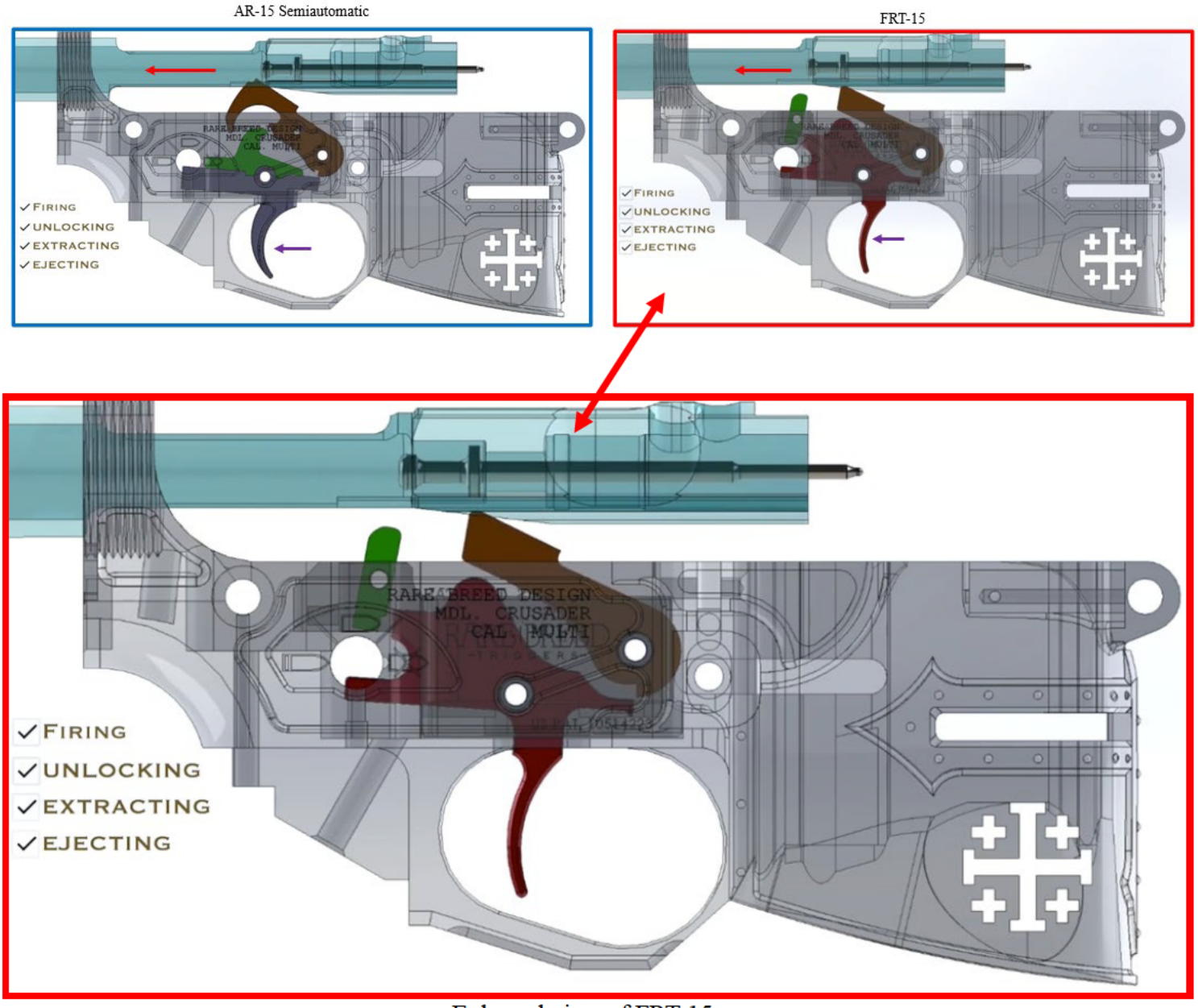
- The fired cartridge case is extracted/withdrawn from the chamber as the bolt carrier group continues its rearward travel, also continuing to further depress the hammer.



Enlarged view of FRT-15

Ejecting:

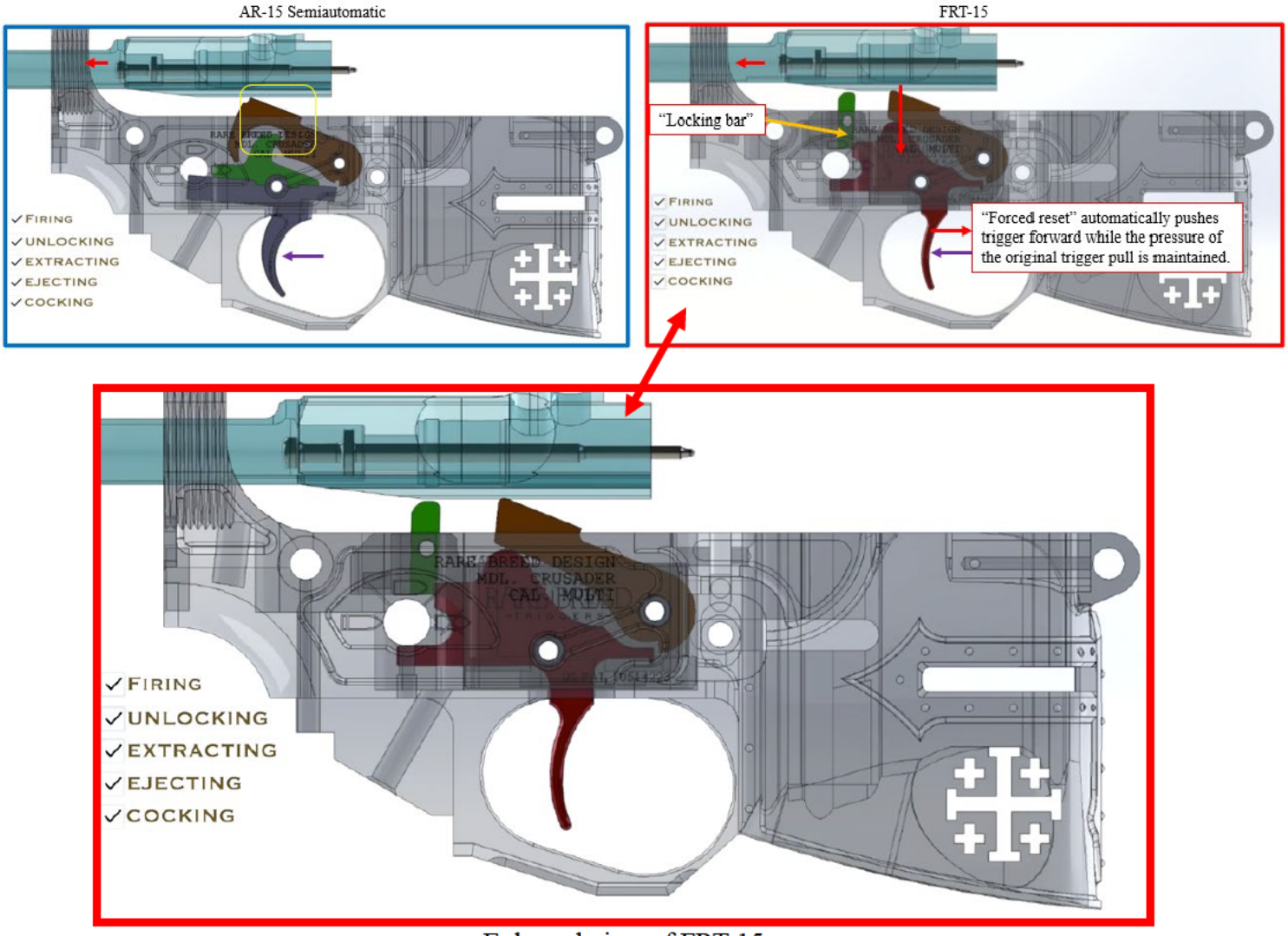
- As the spent case is fully extracted/withdrawn from the chamber, the spring-loaded ejector, acting against the left side of the case head, pushes the spent case out of the ejection port. The bolt carrier group continues rearward, still depressing the hammer.



Enlarged view of FRT-15

Cocking:

- At this point, the operation of a firearm with an FRT-15 (right and bottom images) differs from a semiautomatic AR15-type firearm (left image). In a semiautomatic AR-15-type firearm, the hammer is pushed down by the bolt carrier and is retained by the disconnector and held there until the shooter releases the trigger (done after *feeding* and *chambering*), the disconnector releases the hammer, and the hammer comes to rest on the trigger sear surface, ready to expel a second projectile with a subsequent pull of the trigger. *Conversely*, in the FRT-15 equipped firearm, as the bolt carrier group continues rearward, the hammer is pushed down by the bolt carrier group, but it also pushes down on the trigger, which forces it forward. The trigger is pushed slightly forward as an automatic consequence of the FRT-15 design without any further action required by the shooter. This causes the hammer to engage the trigger sear surface. Differing from a standard semiautomatic firearm, the unique FRT-15 trigger design also engages the "locking bar" to momentarily keep the trigger in place so that the shooter may not override the timing of the automatic functioning of the weapon.



Enlarged view of FRT-15

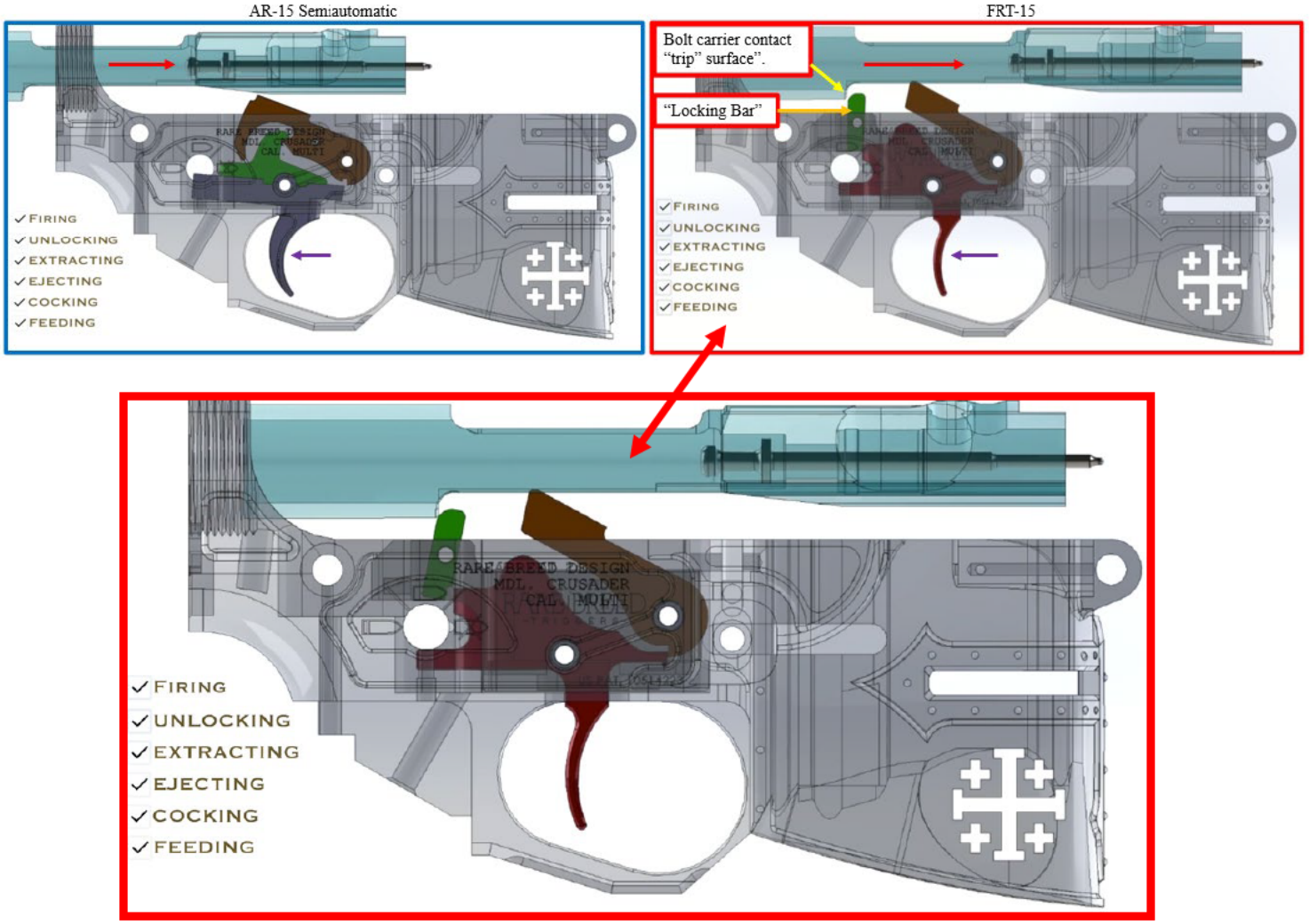
"Timing" in relation to automatic firearms can be described as ensuring that the firing mechanism is not activated until the bolt or breech is fully locked or in battery. Timing is especially important in automatic weapons because if the firing mechanism is engaged before the bolt or breech is fully locked or in battery, two possible outcomes can occur. The first being the firing mechanism *does not* have enough force to ignite the primer, causing a malfunction known as failure to fire, which would cause the shooter to manually clear the malfunction and begin the process over again. The second being that the firing mechanism *does* provide enough force to ignite the primer and an often catastrophic malfunction, known as an "out-of-battery detonation" occurs. An "out-of-battery detonation" occurs when a round is fired without being fully seated in the chamber and the chamber not being fully sealed to contain the explosion. This causes the pressure from the round (e.g.: approximately 55,000 psi in a .223 Remington cartridge) to be released into the action of the firearm, often causing catastrophic damage to the firearm, and possibly the shooter.

It is important to note that at this moment the hammer is solely retained by the trigger sear surface. The trigger, still being pulled rearwards by the shooter is unable to disengage from the hammer because the "locking bar" prevents the trigger from dropping out of engagement with the hammer. This is done to prevent the firearm from operating in what is known as a "hammer follow" condition. "Hammer follow" is described as when the hammer is not retained by the disconnector and follows the bolt as it feeds the cartridge into the chamber. Without mechanical delay in hammer travel imparted, the hammer fall is uncontrolled and may lack sufficient force to detonate the primer of the cartridge. Hammer follow AR-type firearms that shoot automatically are classified as "**machineguns**."

This section is intentionally left blank.

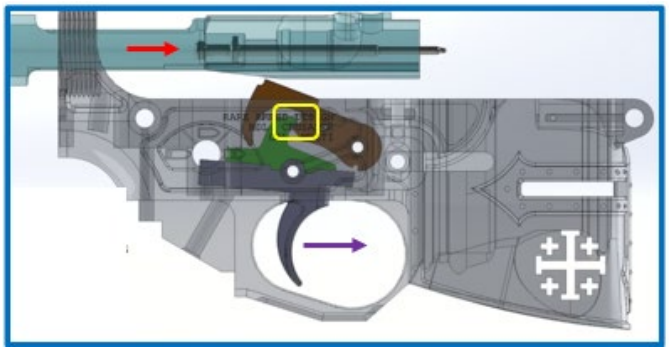
Feeding/Chambering:

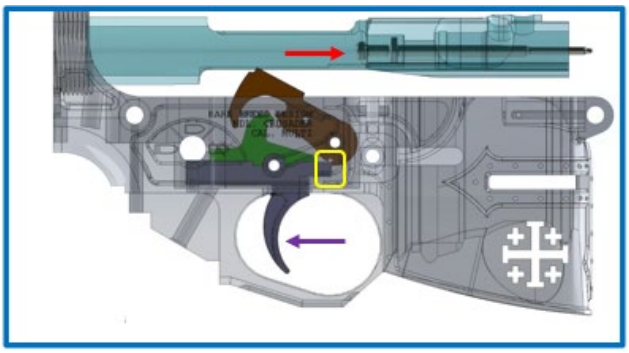
- As the bolt carrier moves forward into battery, using the force of the action spring, the front of the bolt removes the next round from the magazine and feeds it into the chamber. Once the bolt is fully locked, and timed properly, the contact surface on the required M16-type machinegun bolt carrier (which is designed to interact with the automatic sear on M16-type firearms), strikes the FRT-15 (right and bottom images) "locking bar," releasing the trigger, which is still being pulled to the rear by the shooter. The necessity of an M16-type machinegun bolt carrier is clear at this point—it acts on the "locking bar" in the same way it acts on the M16-type machinegun automatic sear. Specifically, when the bolt moves forward into firing position, and is fully locked, it contacts the surface area on the "locking bar" or the automatic sear and automatically fires a subsequent round while the initial single pull is maintained on the trigger. Note that the disconnector on the semiautomatic AR15-type continues to retain the hammer until the shooter manually releases the trigger.



Enlarged view FRT-15

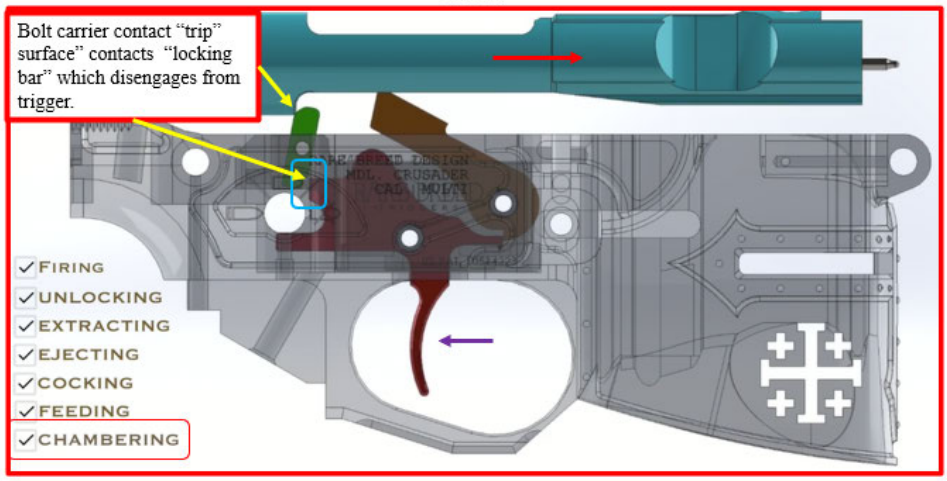
- After firing a shot with a semiautomatic AR15-type firearm, the shooter is required to manually release the trigger which releases the hammer from the disconnector (left image in yellow box) and the hammer comes to rest on the trigger sear surface (right image in yellow box), and then manually pull the trigger a second time to fire a subsequent shot. The disconnector is designed to retain the hammer and "disconnect" or stop the firing cycle from automatically continuing, until the shooter has manually manipulated the trigger by releasing it.





- If the shooter maintains constant rearward pressure from the original single function (pull) of the trigger, the FRT-15 trigger will automatically perform the functions described above in a self-acting or self-regulating mechanism, allowing subsequent projectiles to be fired during the continuing cycle of operation. This self-acting or self-regulating mechanism in the FRT-15 device is the function of the bolt carrier assembly pushing down the hammer, which then pushes down on the trigger, forcing it forward. This is done as an automatic function utilizing the operation of the AR15-type system, with no input needed from the shooter. The "locking bar" is a key component of this self-acting or self-regulating mechanism, as once the bolt carrier assembly has "tripped" the "locking bar," the firing cycle automatically continues, and will continue until the shooter manually releases the trigger, or the ammunition is exhausted.

FRT-15



With pressure still maintained from the original continuous function (pull) of the trigger, the trigger, which was momentarily kept in the forward position into which it was automatically forced, is now free to fire subsequent shots with maintained pressure from the original function (pull) of the trigger, due to the self-acting or self-regulating mechanism. The "locking bar" performs a timed delay function which is automatically disengaged during the operating cycle of the firearm, rather than a positive disconnect, as does the standard AR-15 type disconnector pictured in images above.

From the moment the trigger is pulled, and as long as rearward pressure is applied to the trigger through a single constant pull, a firearm with an FRT-15 continues to fire until the finger is removed from the trigger, the weapon malfunctions, or the ammunition is exhausted. The described firing cycle takes place regardless of the purported "forced reset" pushing the trigger forward.

To demonstrate this, I installed Exhibit 42 into a Daniel Defense model DDM4 (ATF tag number 0581217) AR15-type rifle from the ATF National Firearms Collection (NFC). Installing the Exhibit into the NFC DDM4 was accomplished in approximately five minutes using a commonly available pin punch, hammer, and a standard "flat-head" screwdriver.

I first test fired the NFC DDM4 **without** Exhibit 42 installed on April 20, 2023, at the ATF test range, Martinsburg, West Virginia, using commercially available, Federal brand, .223 Remington caliber ammunition and a magazine from the NFC. I inserted a one-round ammunition load and pulled the trigger. The NFC DDM4 successfully expelled a projectile by the action of an explosive. I then inserted a two-round ammunition load and pulled the trigger. The NFC DDM4 expelled only one round for each separate function of the trigger. Next, I inserted a five-round ammunition load and pulled the trigger; the NFC DDM4 expelled only one round for each separate function of the trigger.

I then test fired the NFC DDM4 **with** Exhibit 42 installed on April 20, 2023, at the ATF test range, Martinsburg, West Virginia, using the same commercially available, Federal brand, .223 Remington caliber ammunition and the same magazine from the NFC. I inserted a one-round ammunition load, with the selector in the "semiautomatic" position and pulled the trigger. The NFC DDM4, with Exhibit 42 installed, successfully expelled a projectile by the action of an explosive. I repeated this same test with the magazine being removed after the cartridge was chambered, and noted that the hammer, rather than remaining in a cocked position, as would normally be the case with a standard AR15-type semiautomatic firearm, after firing one round with a single function (pull) of the trigger, had been released a second time, indicating that Exhibit 42 had initiated a second firing cycle with the original single function (pull) of the trigger. I repeated this method of test-fire one additional time, obtaining the same result.

I then inserted a two-round ammunition load and pulled the trigger; the NFC DDM4, with Exhibit 42 installed, fired both rounds automatically by a single function of the trigger. I repeated this method of test fire two additional times, achieving the same result.

Next, I inserted a five-round ammunition load and pulled the trigger. The NFC DDM4, with Exhibit 42 installed, fired all five rounds automatically, without manual reloading, by a single function of the trigger. I repeated this five-round method of test fire two additional times, achieving the same result.

The FRT-15 "drop-in" device is uniquely designed to interact with the required M16-type machinegun bolt carrier during the cycle of operation in the same manner that the M16-type machinegun bolt interacts with the machinegun automatic sear. This allows the weapon to function automatically with the FRT-15 self-acting, or self-regulating mechanism, with one continuous pull of the trigger, and allows the weapon to shoot automatically, more than one shot, without manual reloading, by a single function (pull) of the trigger, until the trigger is manually released by the shooter, or the ammunition is exhausted.

While on standard semiautomatic AR15-type firearms, the cycle of operation is interrupted between shots by a disconnector which requires that the trigger be both manually released and then manually pulled again to fire a subsequent shot, no such action is required to fire subsequent shots on the FRT-15 equipped AR15-type firearm. Indeed, the FRT-15 design requires only that the shooter maintain the initial trigger pull, while the self-acting or self-regulating FRT-15 mechanism forces the trigger forward during the rearward movement of the required M16-type machinegun bolt carrier, and then automatically releases the trigger and hammer, as the "locking bar" interacts with the "trip surface" on the M16-type machinegun bolt carrier, as the firearm goes into battery. All of these actions occur if the shooter maintains a single, constant pull of the trigger.

For informational purposes, the cyclic rate of fire of an M16-type, M4 machinegun is approximately 700 to 970 RPM as published in U.S. Army Technical Manual TM 9-1005-319-10, page 0002 00-3. To verify this, FTCB has previously tested the rate of fire of a 5.56 caliber M16-type, M4 machinegun, (tag number 0488490) from the ATF NFC utilizing a Competition Electronics brand shot timer to measure the approximate rounds per minute (RPM). This test determined that the average rate of fire of the NFC M16-type, M4 machinegun (tag number 0488490) was **870.4** RPM.

To demonstrate that the cyclic rate of fire with an FRT-15 machinegun conversion device equipped semiautomatic AR-type rifle is comparable to an M16-type machinegun, the same test was previously conducted utilizing a .223 Remington caliber NFC AR15-type semiautomatic rifle receiver (tag number 0550101) equipped with an FRT-15 machinegun conversion device and utilized the same upper assembly, buffer, and recoil spring used with the NFC M16 rate of fire test. This test determined that the average rate of fire of the NFC semiautomatic AR15-type rifle receiver (tag number 0550101) equipped with a Rare Breed Triggers FRT-15 machinegun conversion device was **840.8** RPM.

It is significant to note that following the above outlined test procedure, utilizing the same magazine and ammunition obtained from the same lot, that the measured rate of automatic fire when both triggers were held to the rear with a single constant pull was similar (870.4/840.8) in both weapons' automatic cyclic rates.

Exhibit 42 is a combination of parts designed and intended for use in converting a weapon into a machinegun, and through demonstration, successfully converted the semiautomatic NFC S-15 rifle into a machinegun; therefore, Exhibit 42, is a "machinegun" as defined.

Conclusions:

Exhibit 42 is a "**machinegun**" as defined in 18 U.S.C. § 921(a)(24).

Exhibit 42 is a combination of parts designed and intended, for use in converting a weapon into a machinegun; thus, is a "**machinegun**" as defined in 26 U.S.C. § 5845(b).

Exhibit 42, being a machinegun, is also a "**firearm**" as defined in 26 U.S.C. § 5845(a)(6).

Exhibit 42 bears no NFA manufacturers marks of identification or serial number as required by 26 U.S.C. § 5842.

Examined By:

ANTHONY CIRAVOLO Digitally signed by ANTHONY CIRAVOLO Date: 2023.04.27 14:27:12 -04'00'

Anthony Ciravolo
Firearms Enforcement Officer

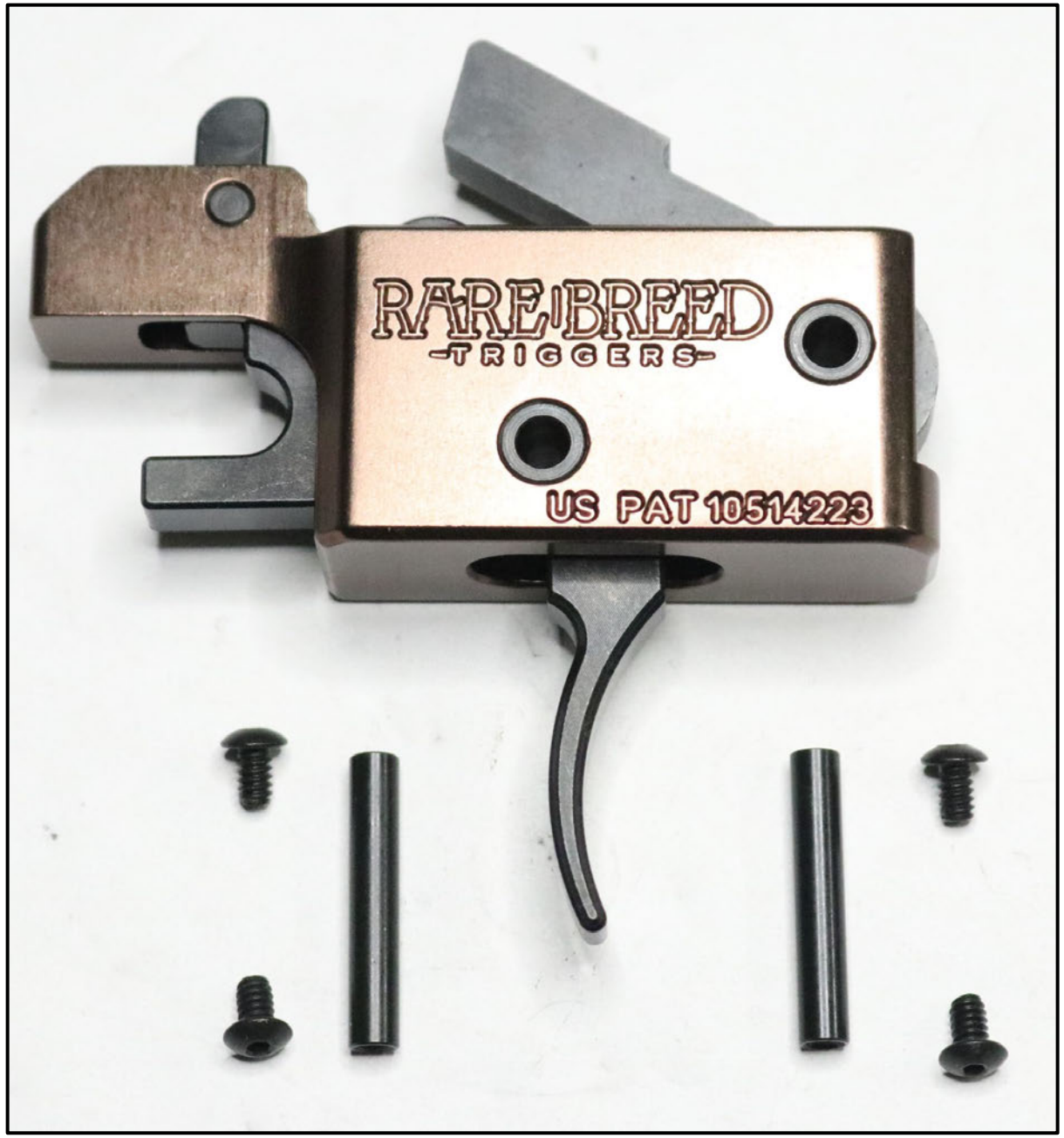
Approved By:

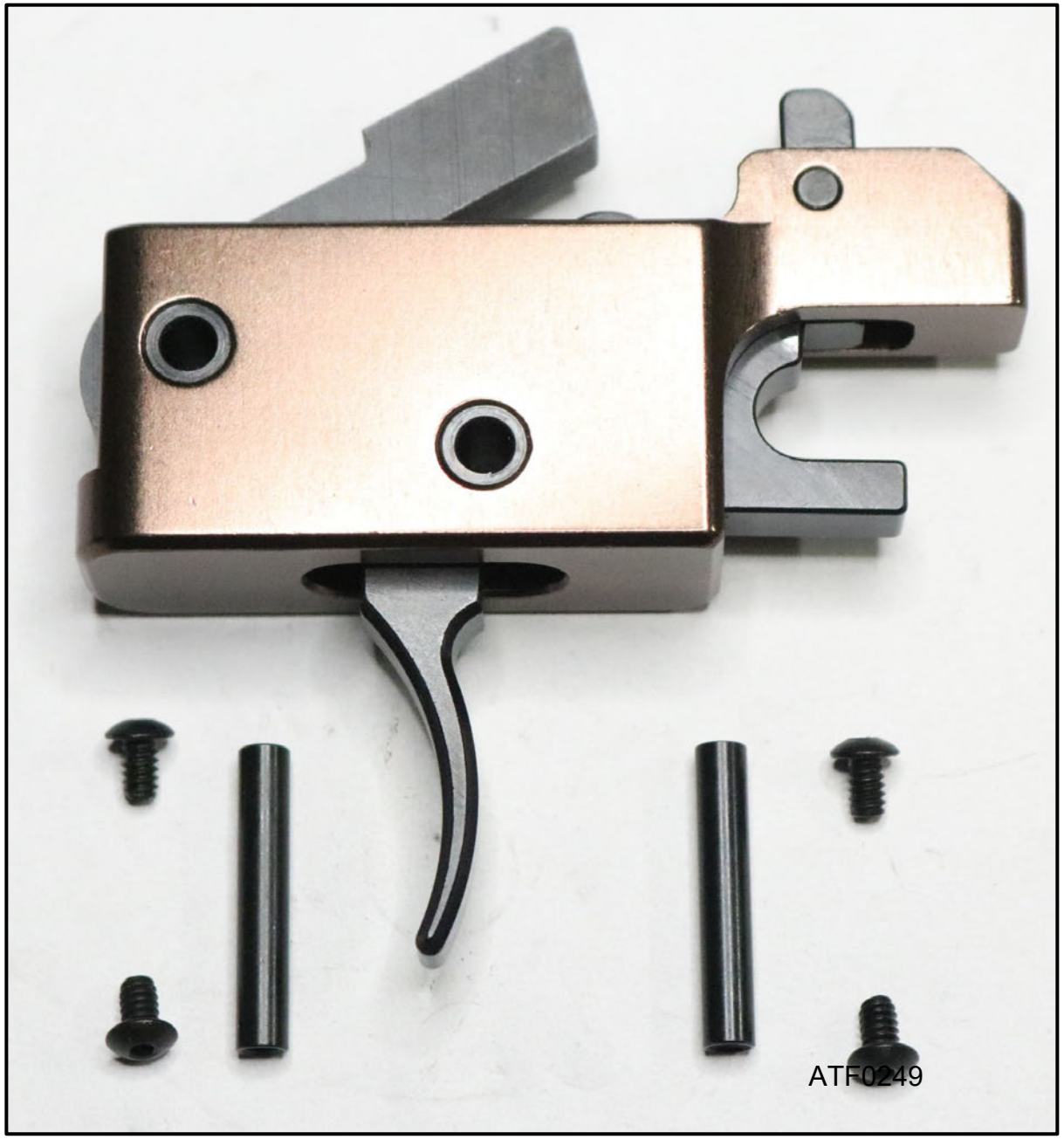
CODY TOY Digitally signed by CODY TOY Date: 2023.04.27 15:05:45 -04'00'

Cody Toy
Chief, Firearms Technology Criminal Branch

Attachment: Thirty pages bearing photographs and U.S. Patent 10,514,223 B1.

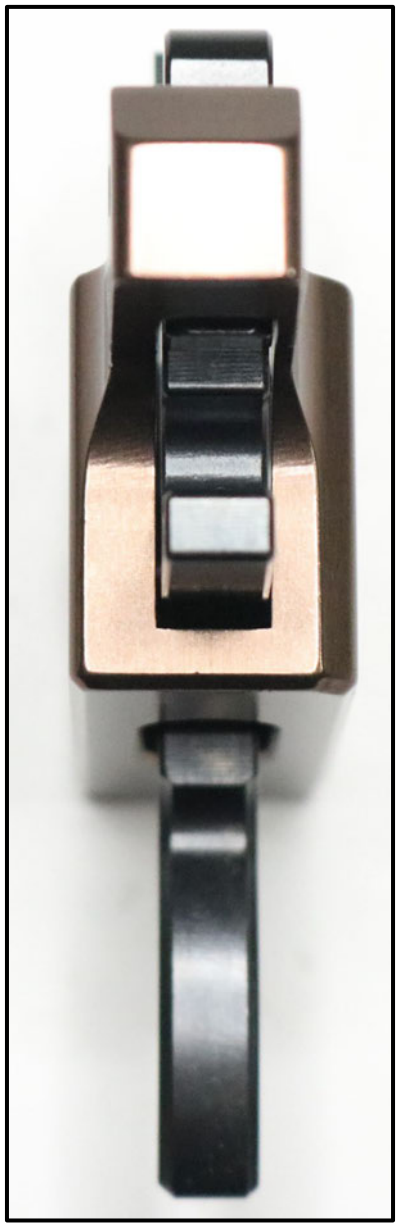
This Firearms Technology Criminal Branch report is provided in response to your request for assistance. Please be aware that these documents may constitute "taxpayer return information" that is subject to the strict disclosure limitations provided in 26 U.S.C. § 6103. Exceptions to the non-disclosure provisions that permit the disclosure internally within ATF are set forth in 26 U.S.C. §§ 6103(h)(2)(C) and (o)(1). Any further disclosure of these reports is strictly limited and must be reviewed and approved by the Office of Chief Counsel prior to any information dissemination. Failure to adhere to the disclosure limitations provided in 26 U.S.C. § 6103 could result in civil and/or criminal liability.


RARE BREED
TRIGGERS
US PAT 10514223


ATF0249

Front

Rear

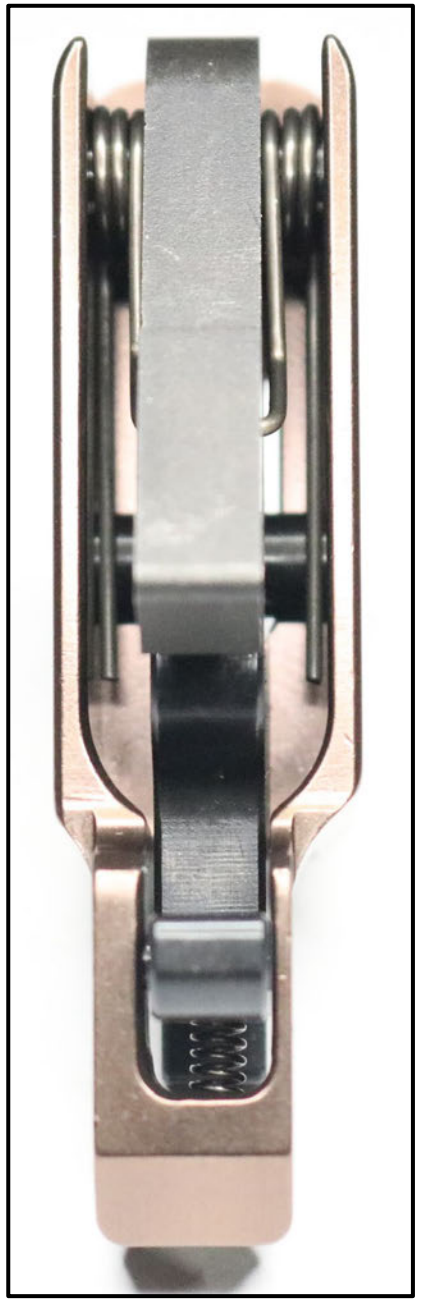


Bottom

ATF0250

Exhibit 42

Hammer Cocked



Hammer Released

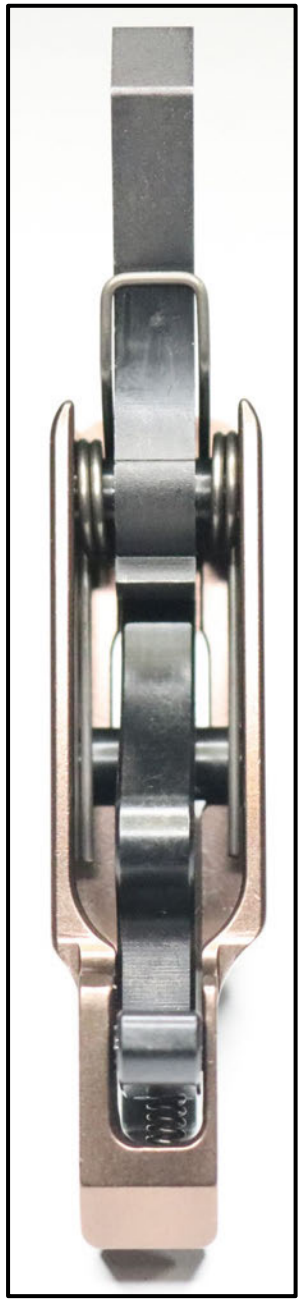


Exhibit 42

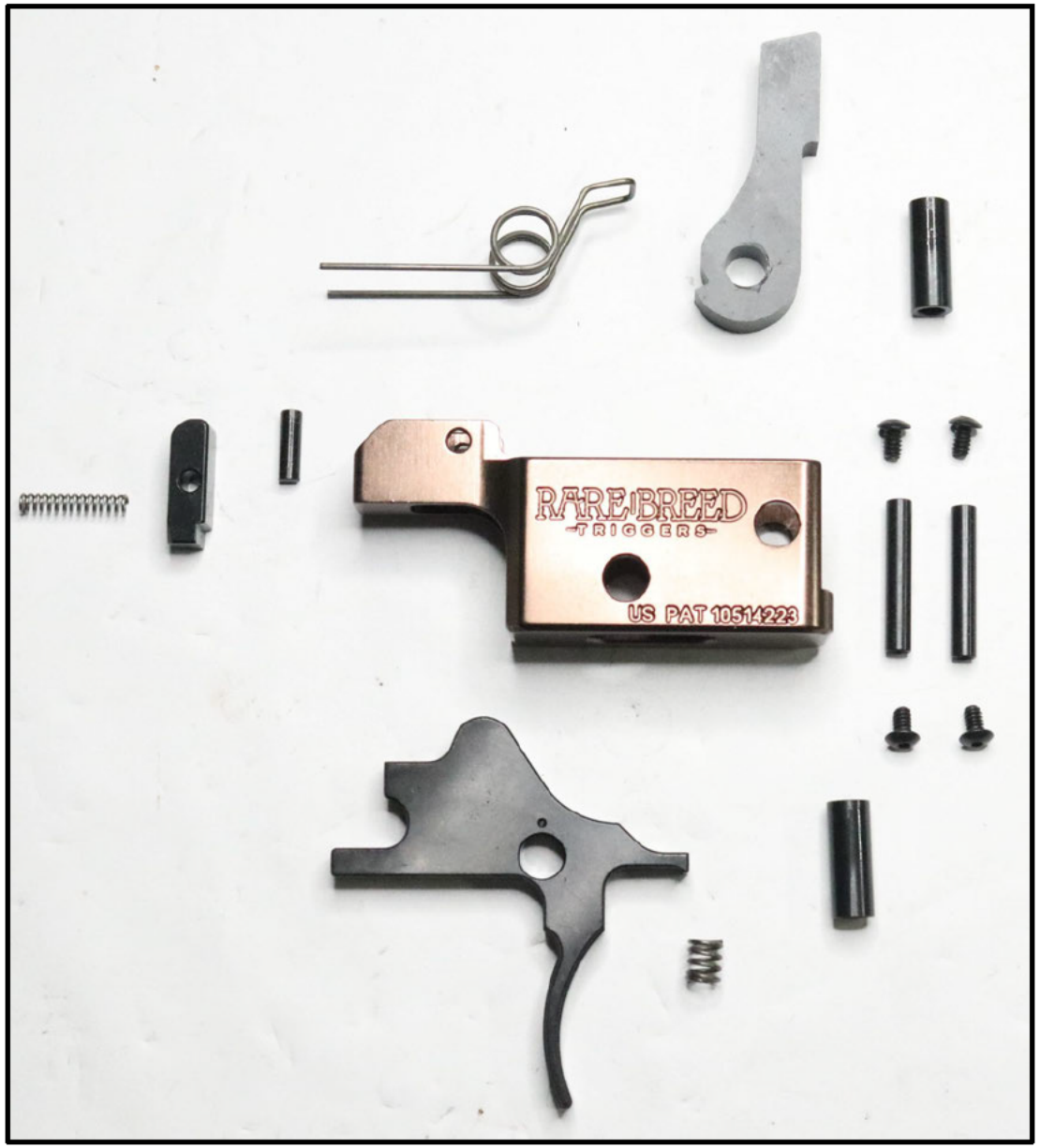


Exhibit 42 Disassembled

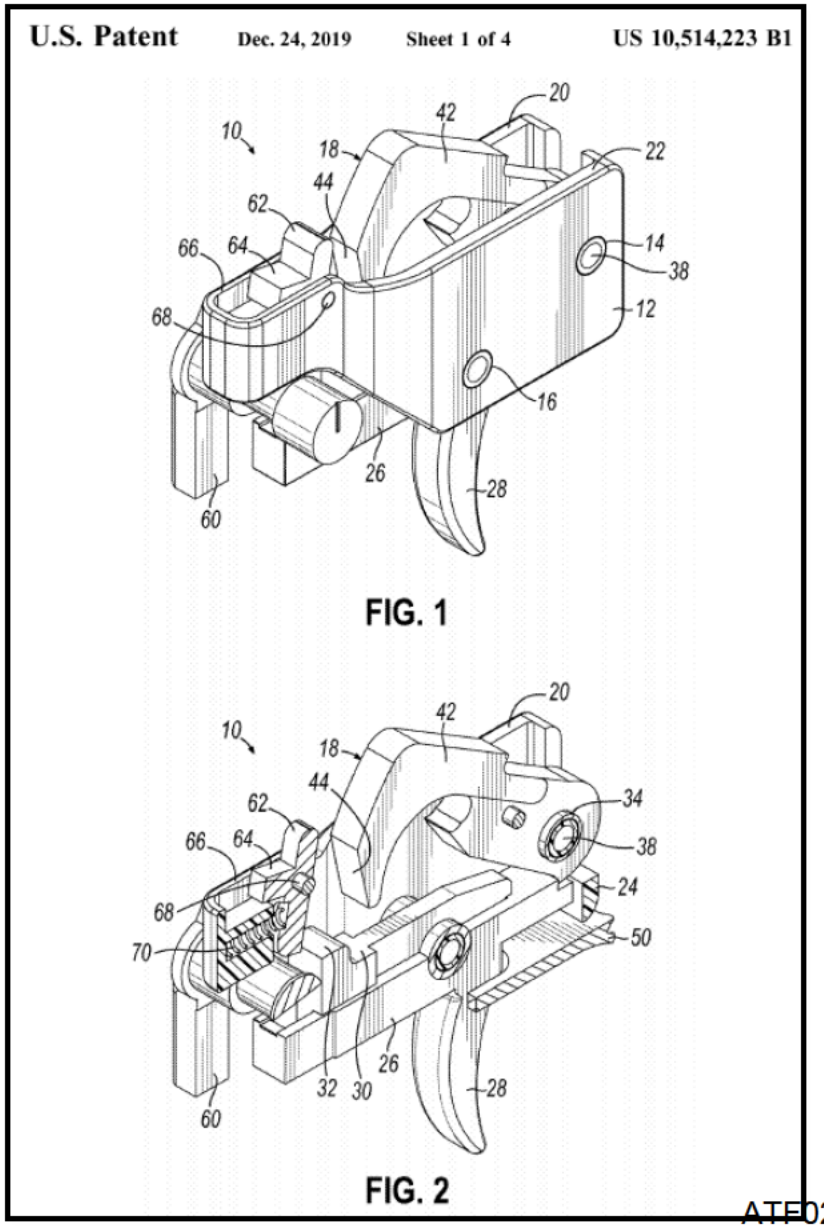
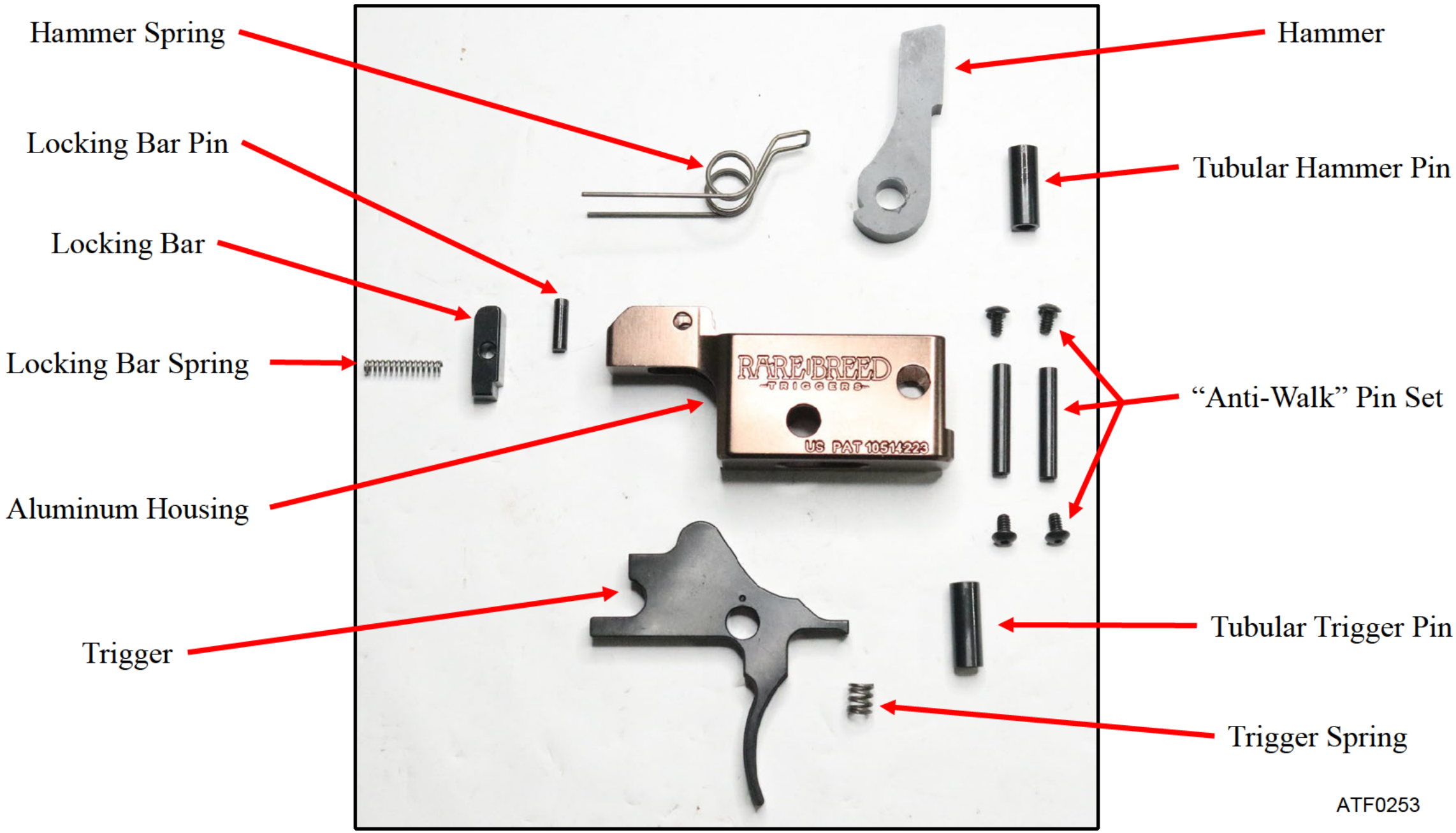
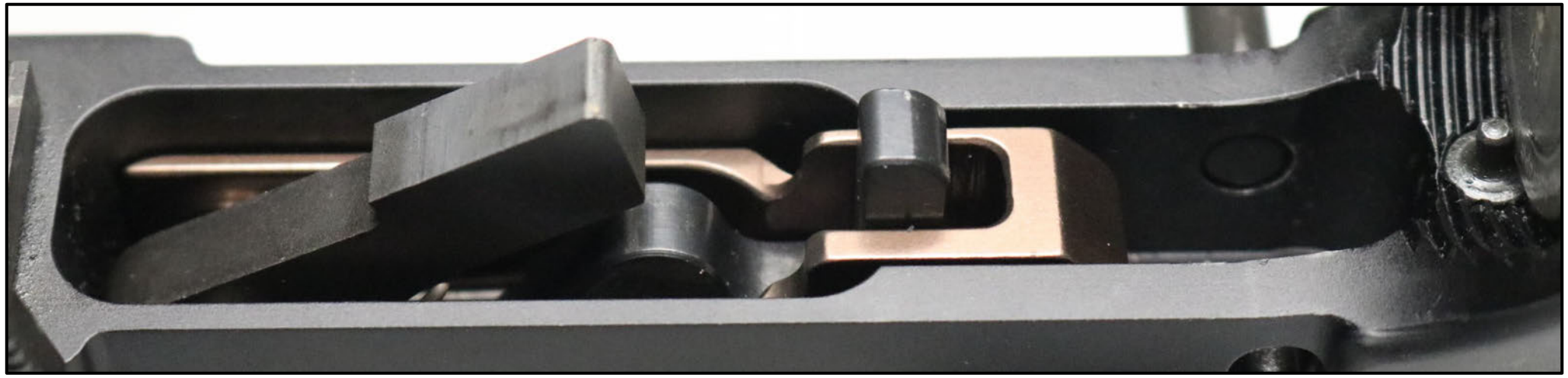


Image contained in Patent No.: U.S. 10,514,223 B1.


Hammer Spring
Locking Bar Pin
Locking Bar
Locking Bar Spring
Aluminum Housing
Trigger
Hammer
Tubular Hammer Pin
"Anti-Walk" Pin Set
Tubular Trigger Pin
Trigger Spring
RARE BREED
TRIGGERS
US PAT 10514223

ATF0253

Exhibit 42 Installed in NFC DDM4



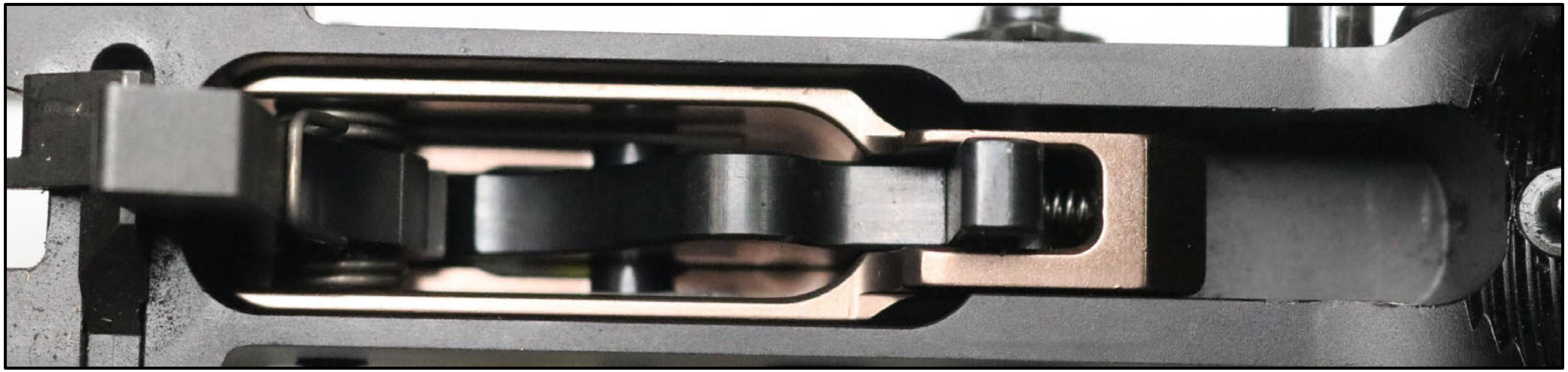


Exhibit 42 Installed in NFC DDM4 (bottom) Compared to NFC M4 Machinegun (top)

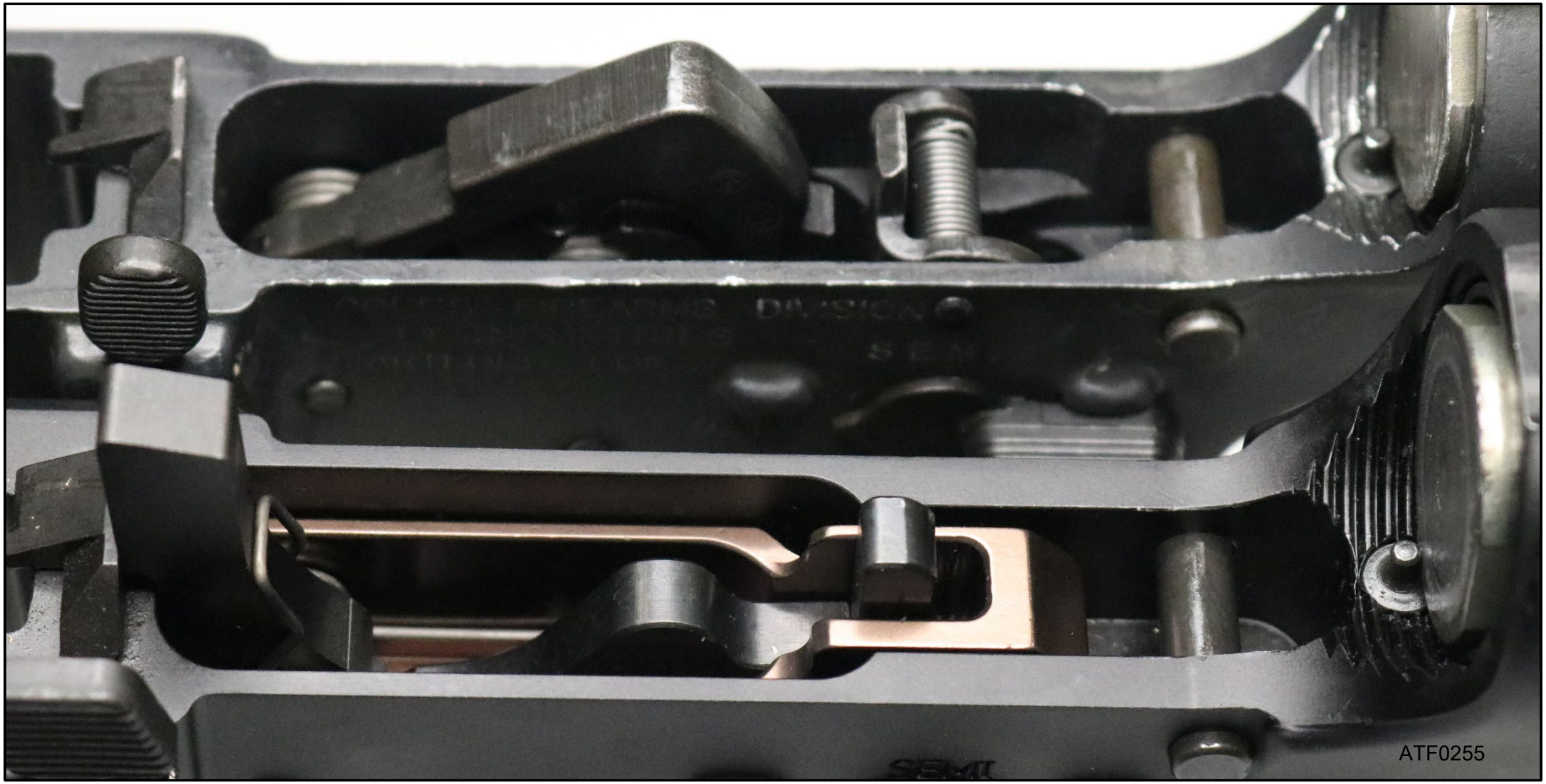
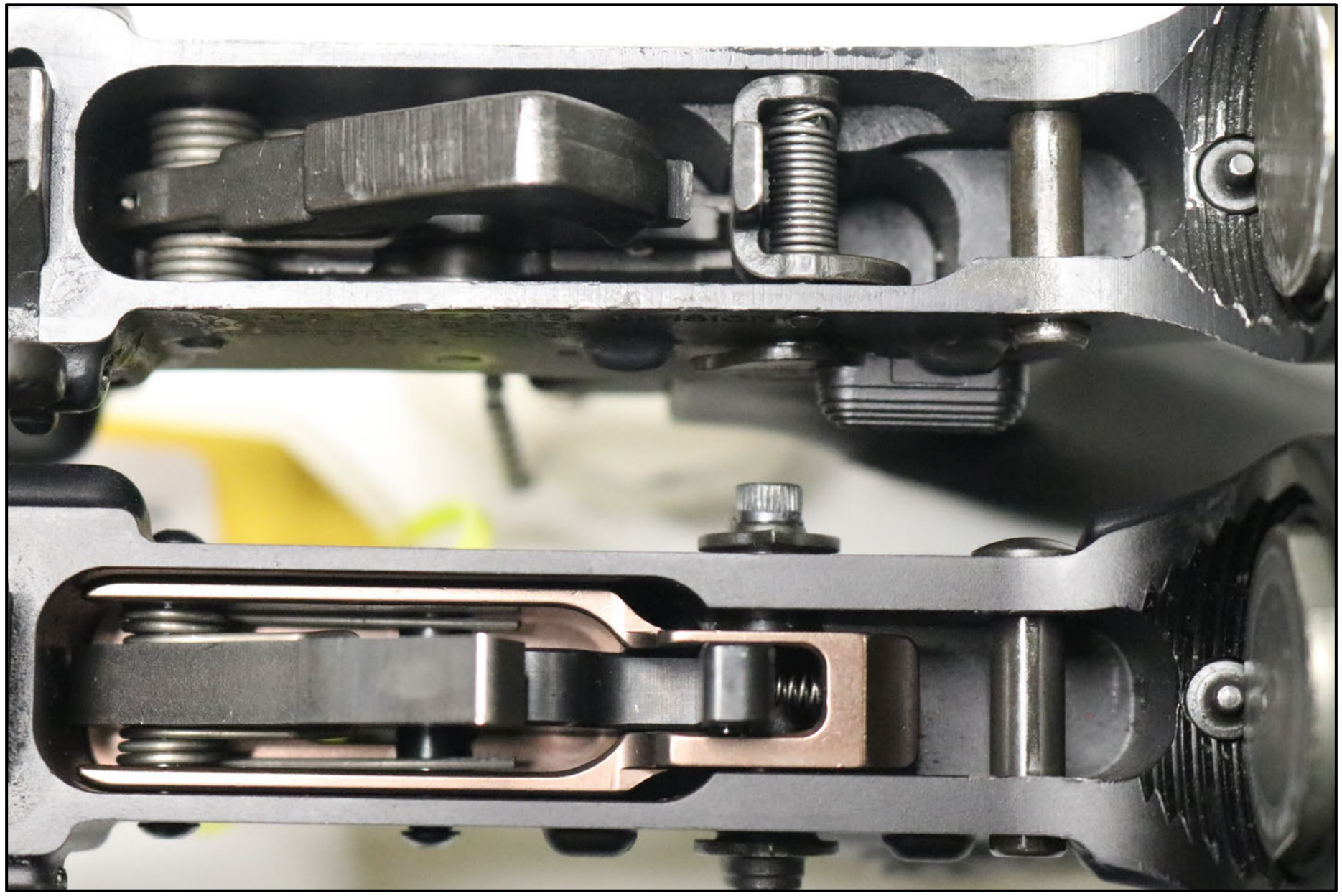


Exhibit 42 Installed in NFC DDM4 (bottom) Compared to NFC M4 Machinegun (top)

Exhibit 42 Installed in NFC DDM4 (bottom) Compared to NFC M4 Machinegun (top)

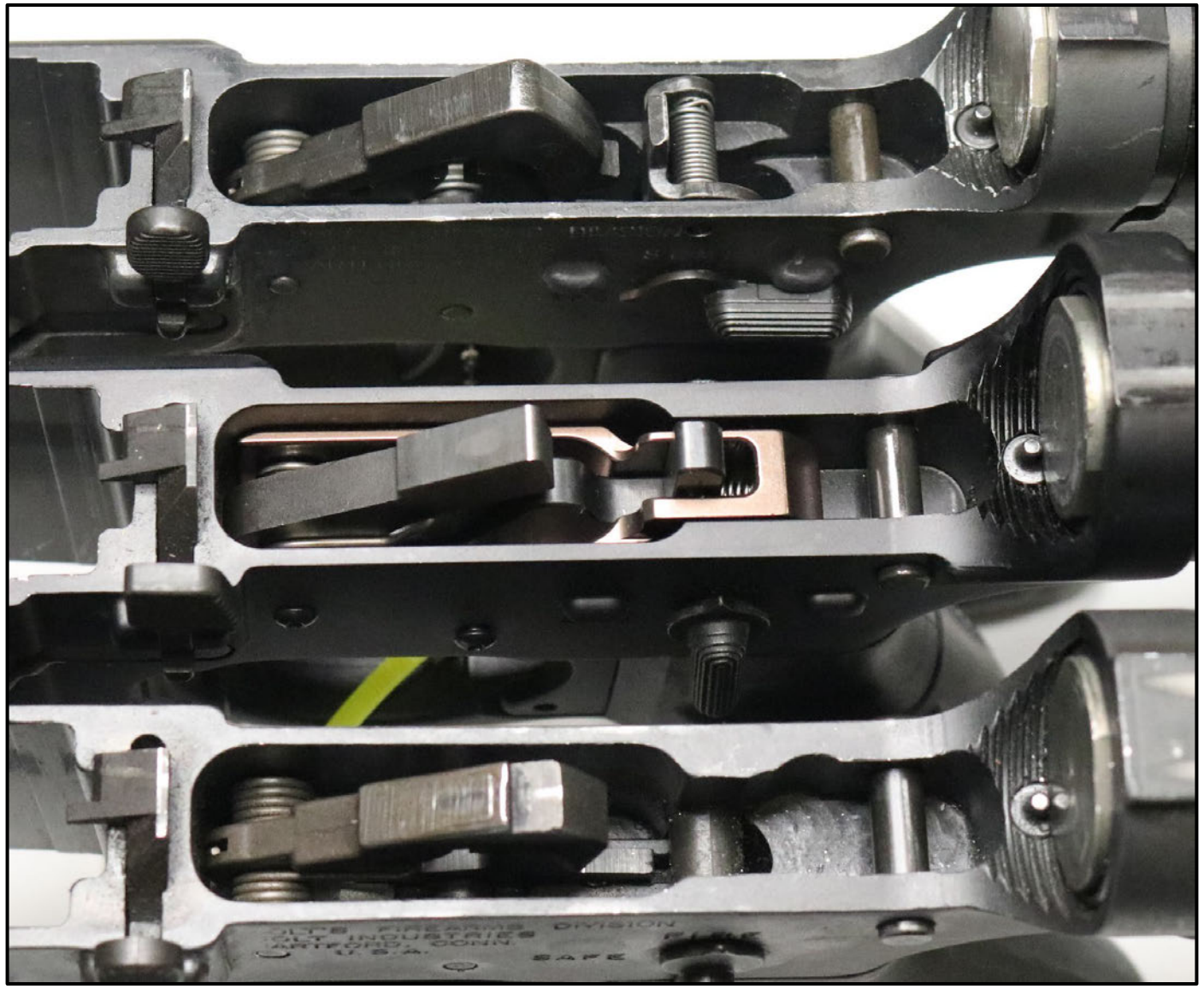


ATF0257

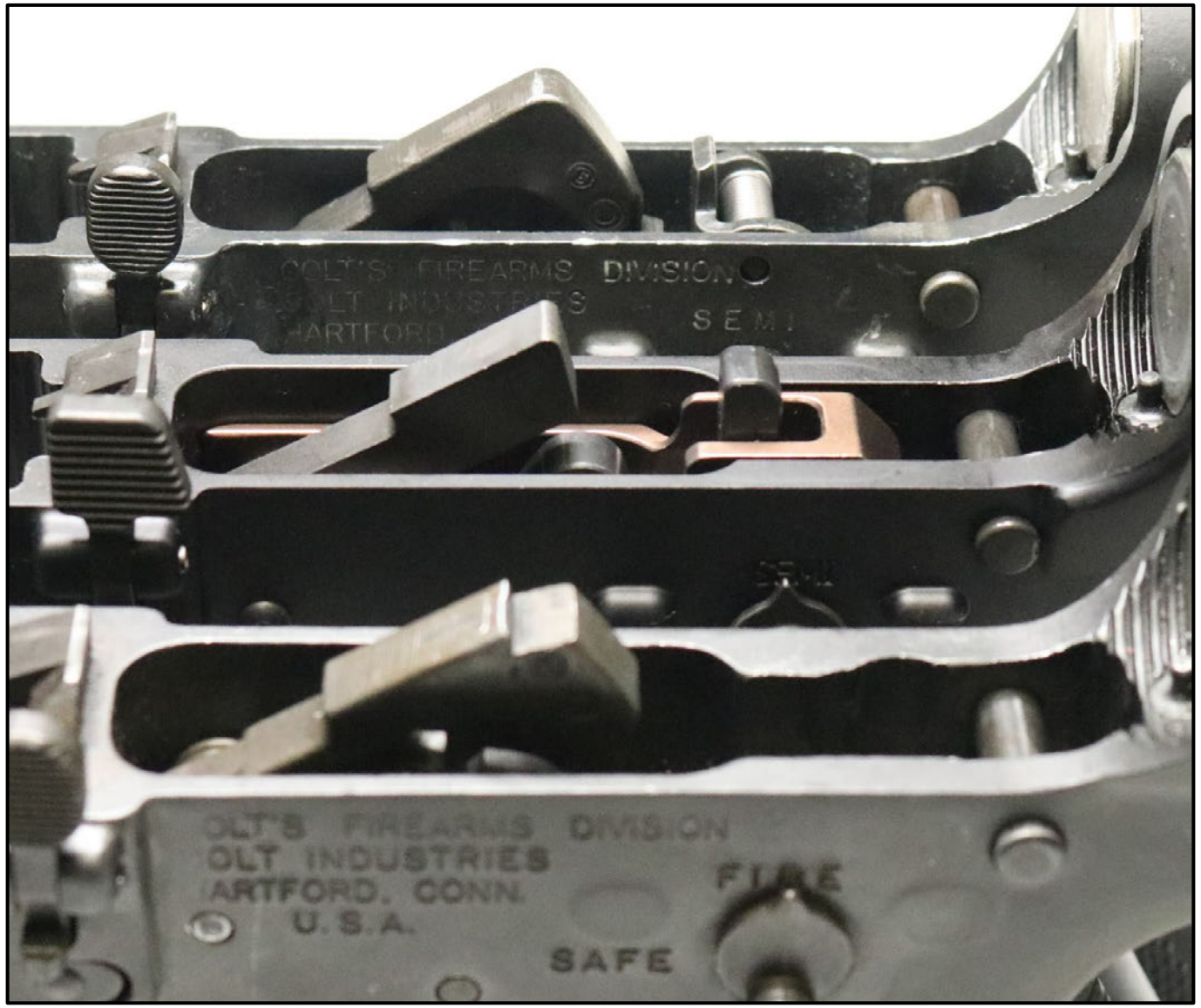
NFC M4 Machinegun (top)

Exhibit **42** Installed in NFC DDM4 (middle)

NFC Colt SP1 Semiautomatic (bottom)



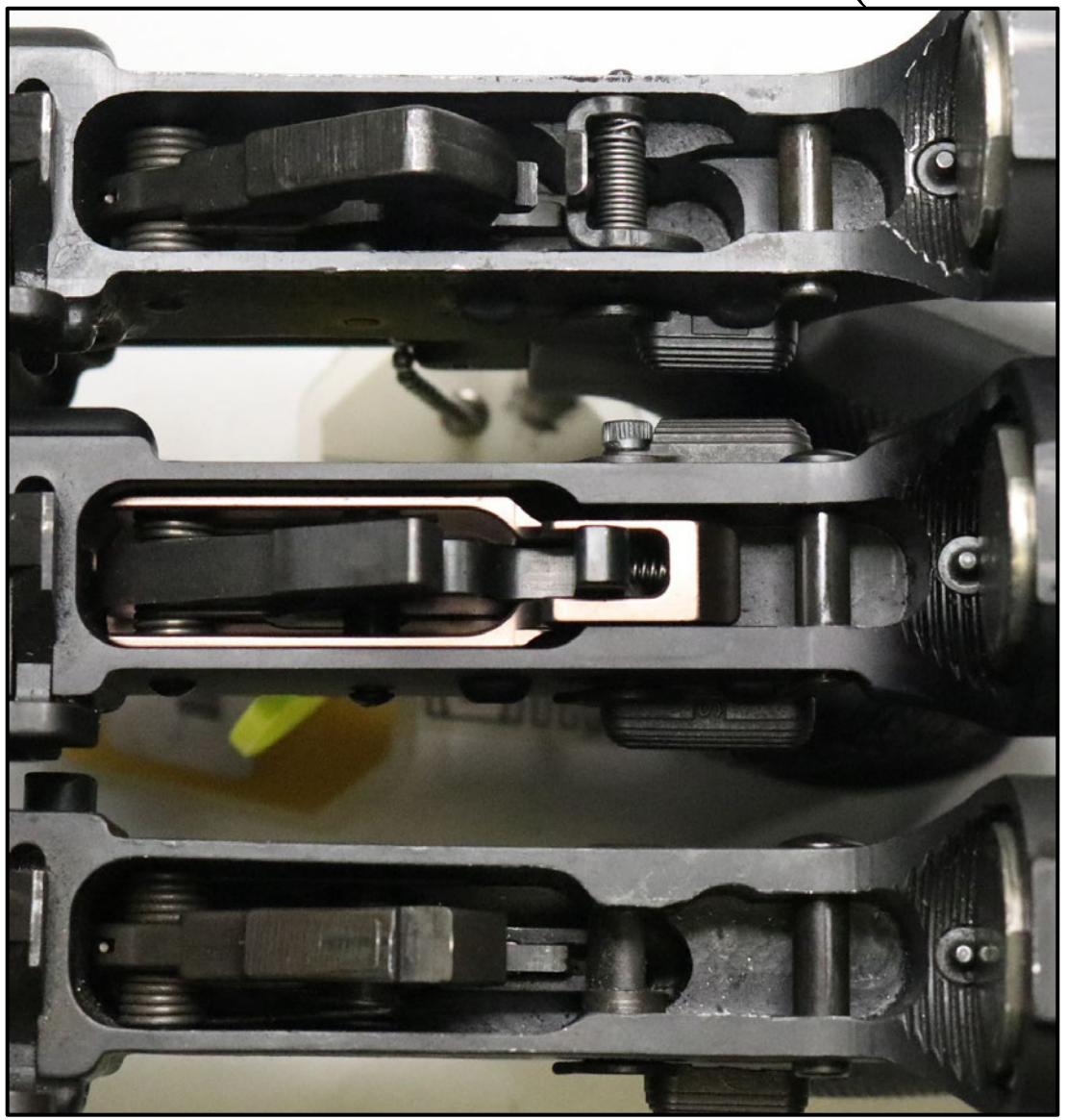
NFC M4 Machinegun (top)
Exhibit **42** Installed in NFC DDM4 (middle)
NFC Colt SP1 Semiautomatic (bottom)



NFC M4 Machinegun (top)

Exhibit **42** Installed in NFC DDM4 (middle)

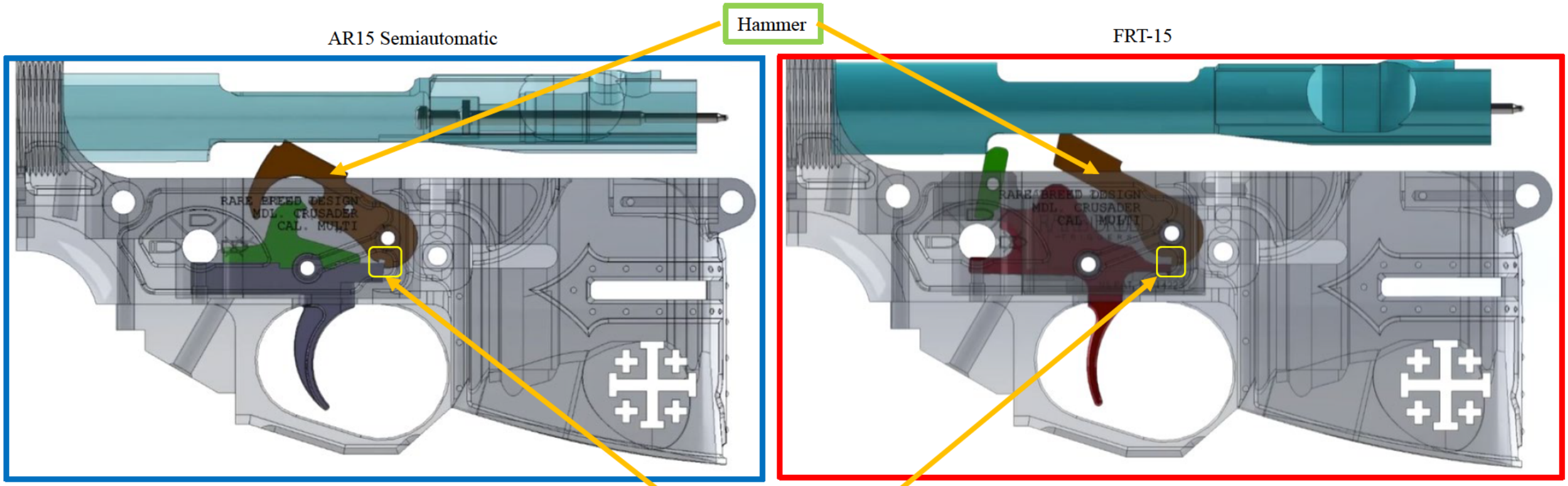
NFC Colt SP1 Semiautomatic (bottom)



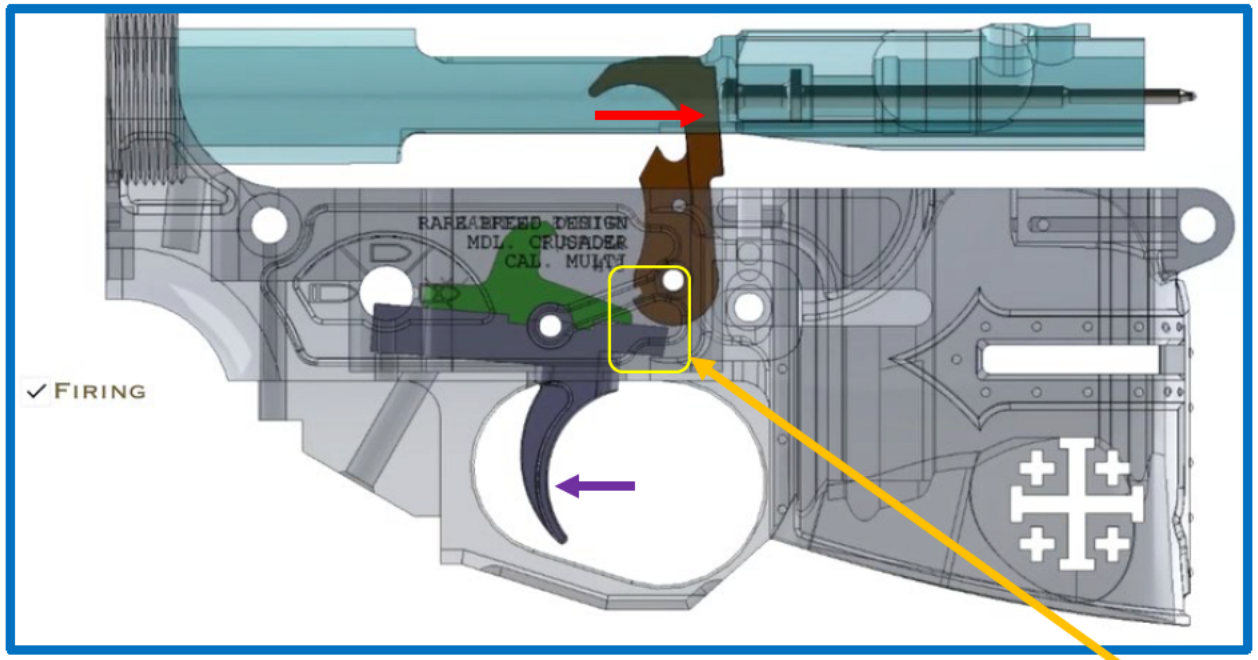
Still images pulled from FRT Full Video animation on Rare Breed Triggers website. Note that image on the left within blue box depicts a standard AR15-type semiautomatic trigger mechanism. Image on the right within red box depicts the FRT-15 trigger mechanism. ATF highlights added.

AR15 Semiautomatic

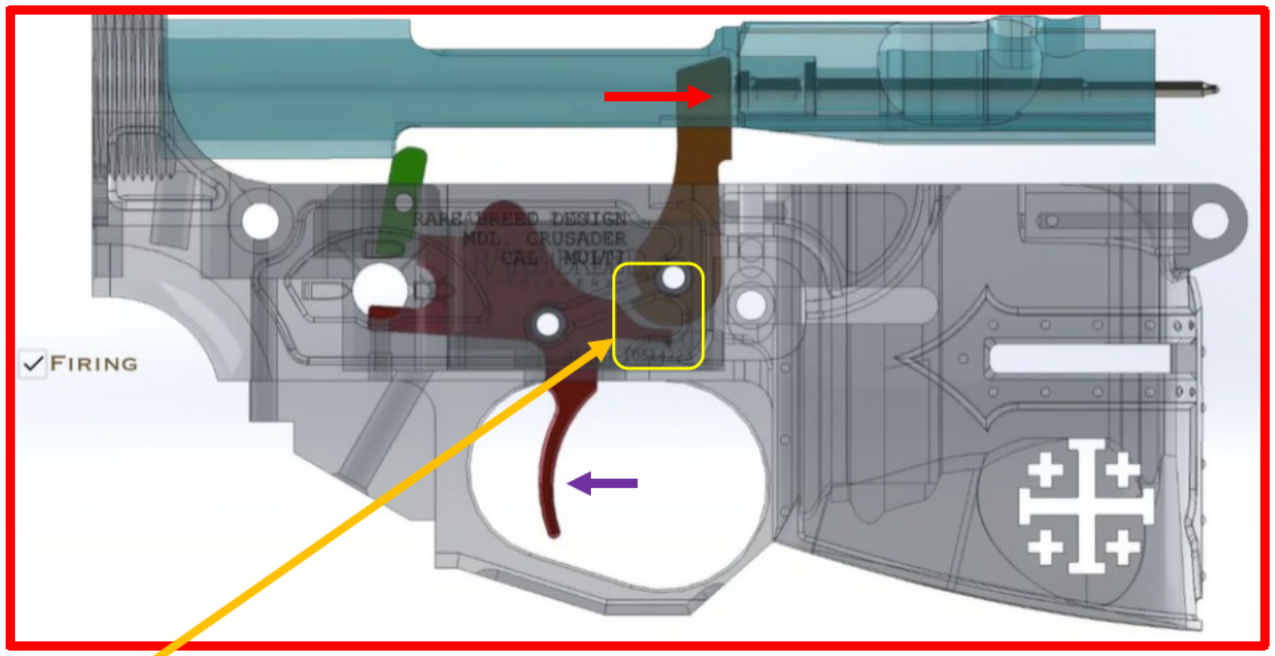
FRT-15



AR15 Semiautomatic



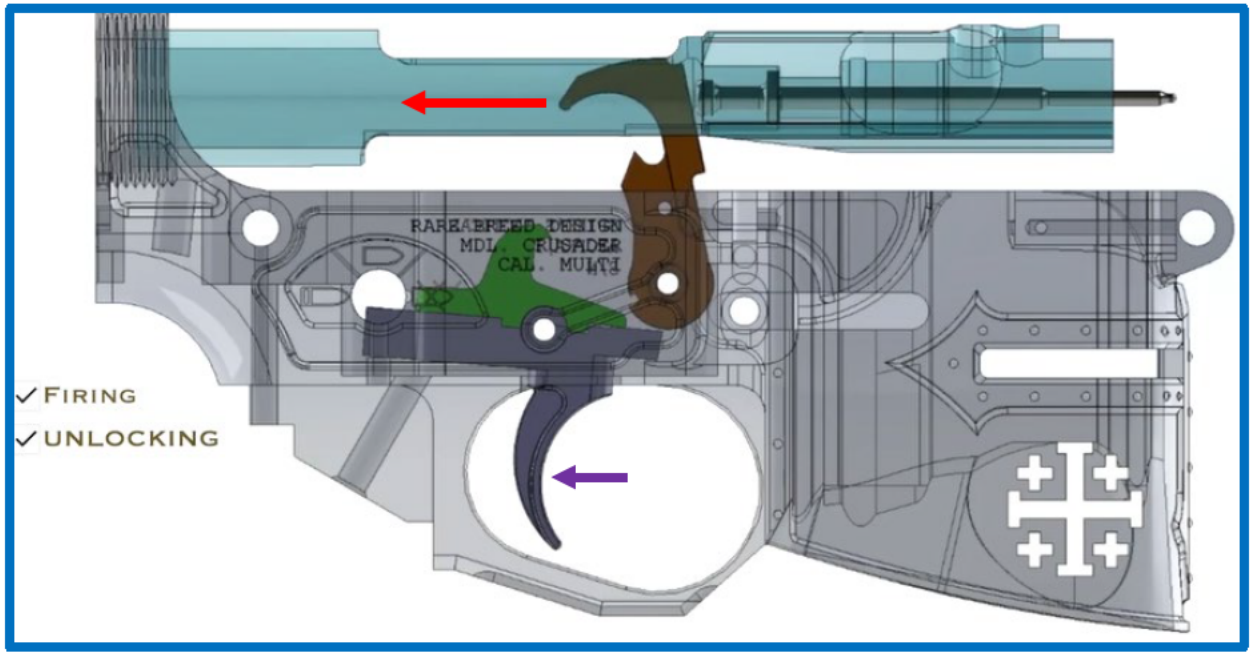
FRT-15



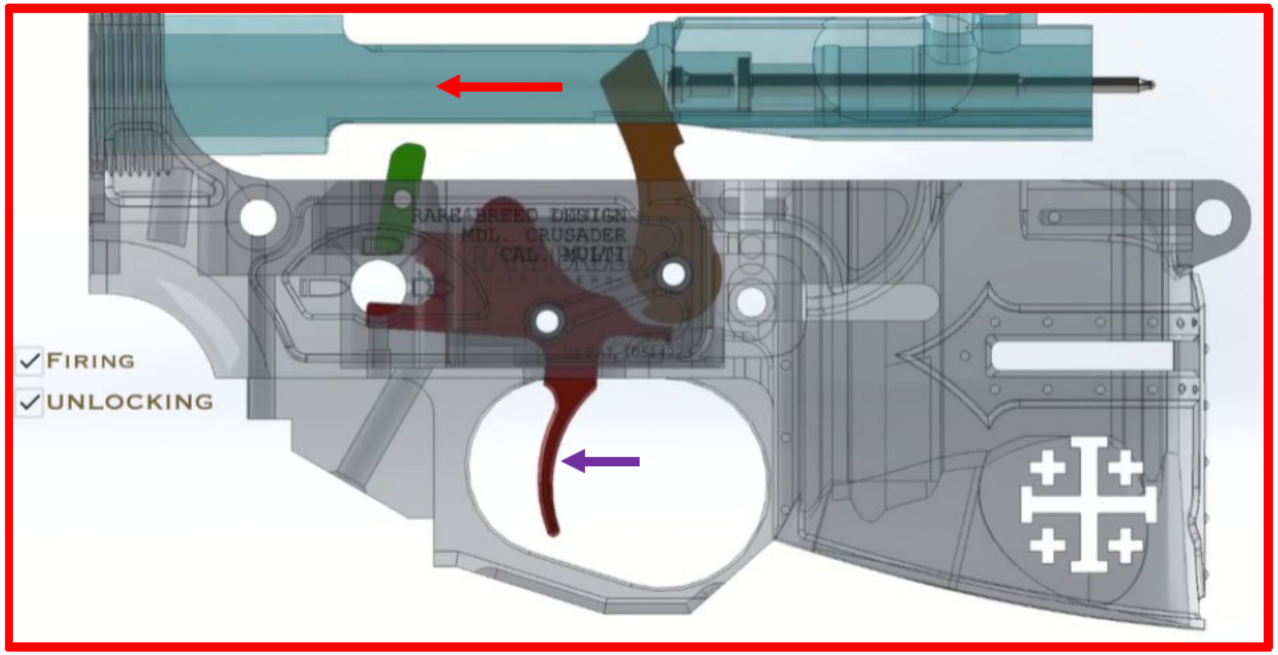
View of both the AR15 semiautomatic firearm (left), and the FRT-15 equipped firearm (right) having the trigger pulled to the rear. The sear, now clear of the hammer, allows the hammer to fall, striking the firing pin, thus firing the chambered cartridge.

Still images pulled from FRT Full Video animation on Rare Breed Triggers web site. Note that image on the left within blue box depicts a standard AR15-type semiautomatic trigger mechanism. Image on the right within red box depicts the FRT-15 trigger mechanism. ATF highlights added.

AR15 Semiautomatic



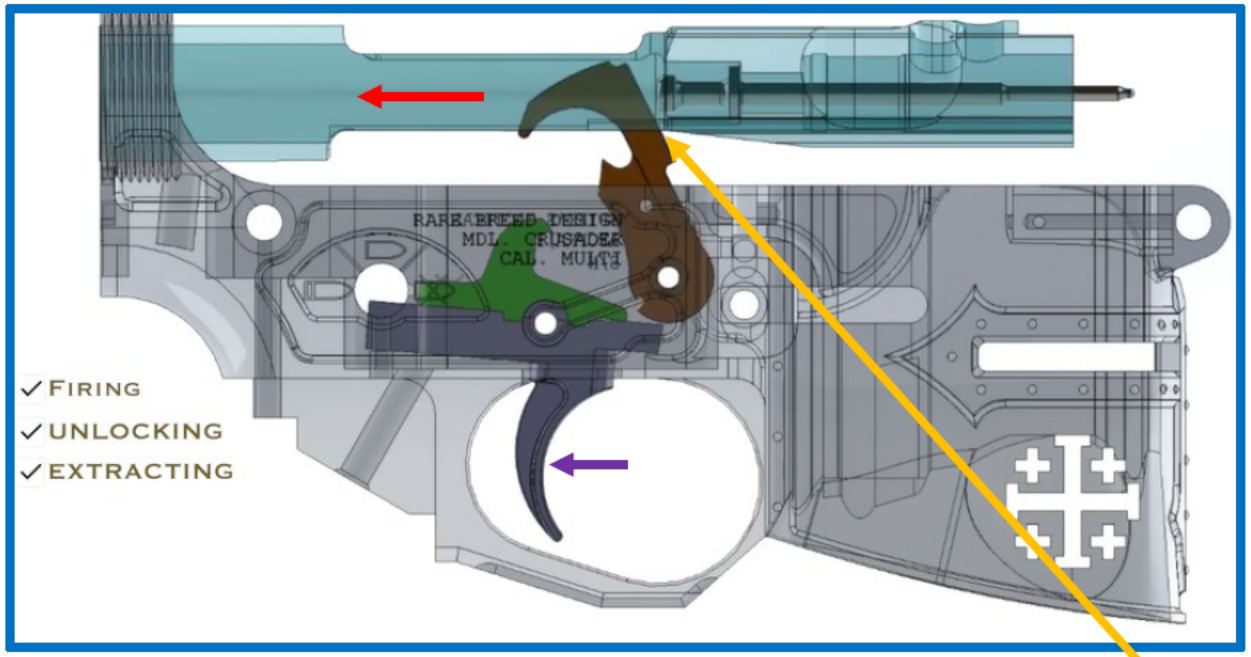
FRT-15



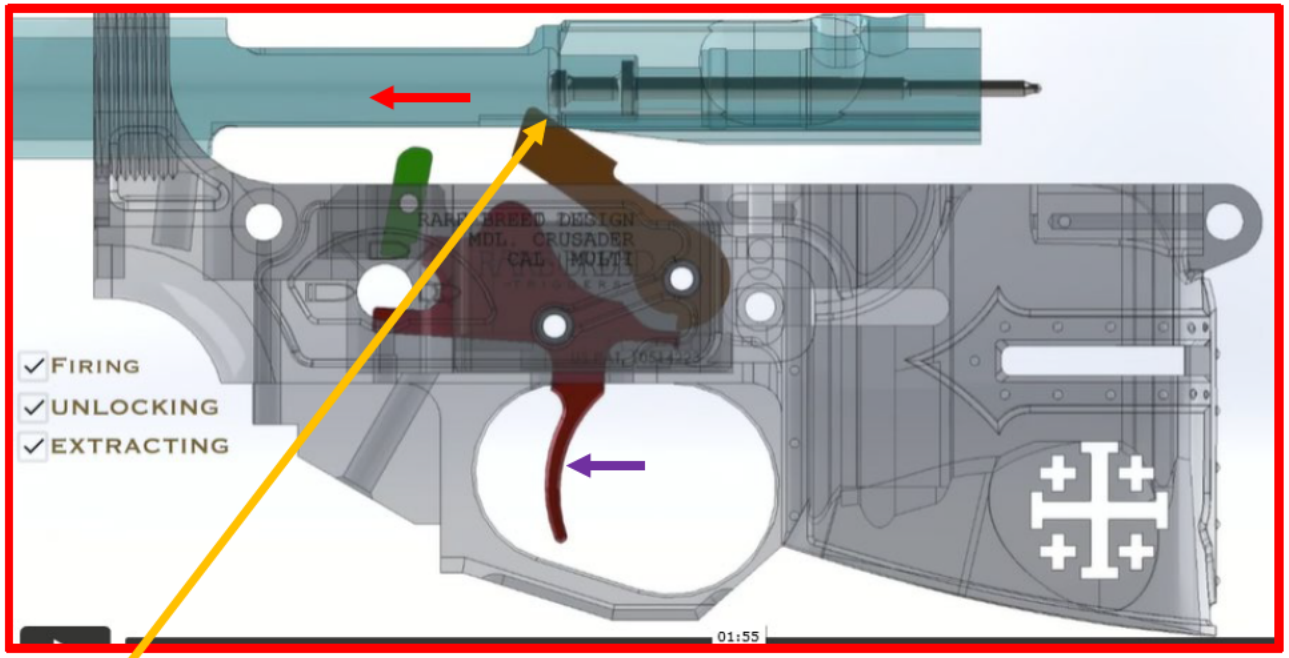
After the chambered cartridge is fired, the pressure of the gas generated by the burning propellant drives the projectile down the barrel and past the gas port, a small quantity of the gas is bled off through the gas port, gas tube and bolt carrier key into a cylindrical section in the bolt carrier where it expands and drives the bolt carrier rearward. Note that this happens rapidly while rearward "pull" pressure from the trigger pull is maintained on the trigger. During the initial rearward travel of the carrier, the bolt is rotated by the cam pin acted on by the bolt carrier cam slot. This rotation disengages the bolt lugs from the barrel extension lugs so the bolt is unlocked. The bolt carrier group then continues rearward with the unlocked bolt assembly which starts to act upon the hammer.

Still images pulled from FRT Full Video animation on Rare Breed Triggers web site. Note that image on the left within blue box depicts a standard AR15-type semiautomatic trigger mechanism. Image on the right within red box depicts the FRT-15 trigger mechanism. ATF highlights added.

AR15 Semiautomatic



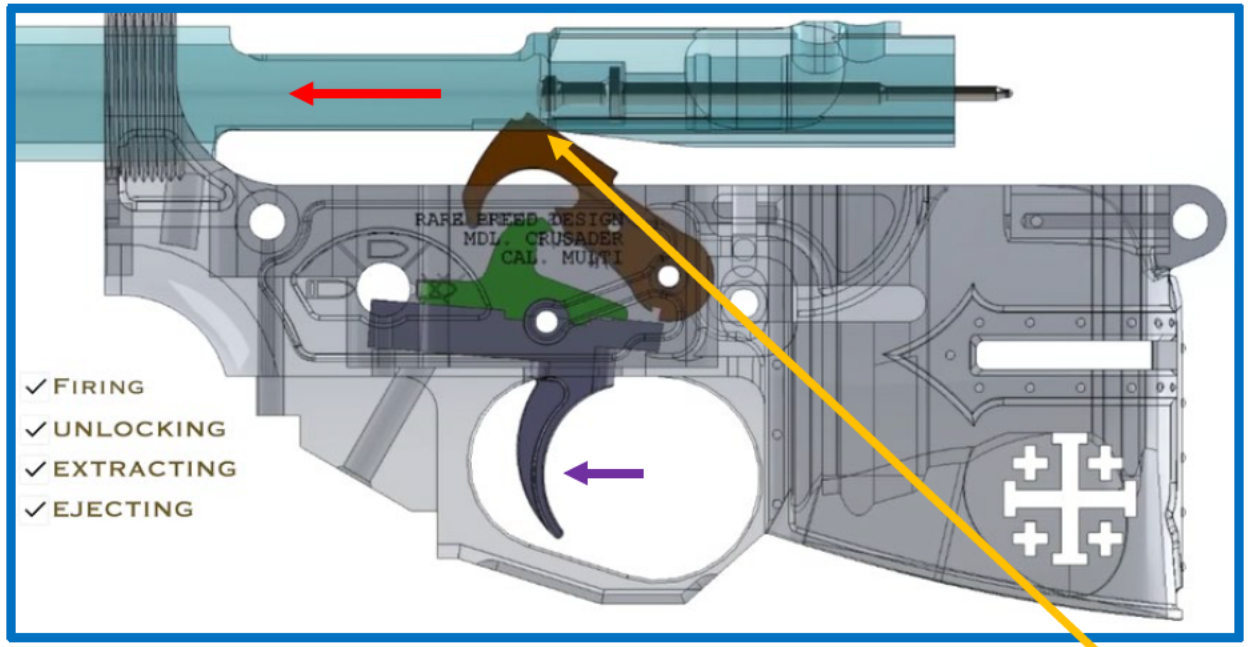
FRT-15



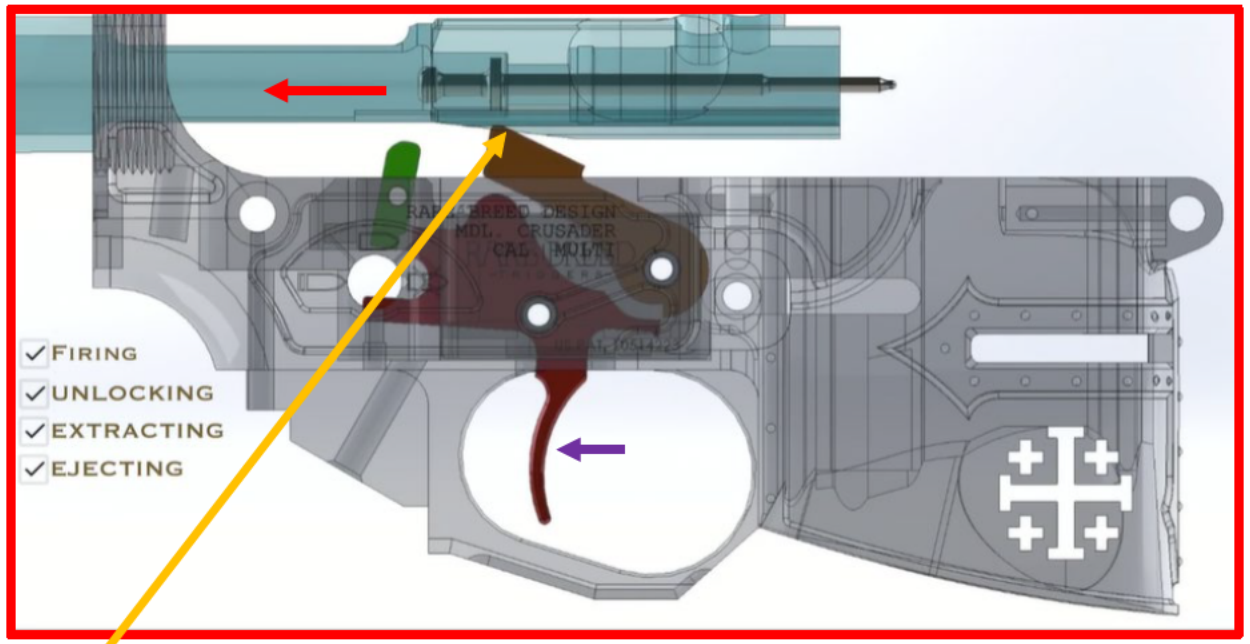
The fired cartridge case is withdrawn from the chamber as the bolt carrier group continues its rearward travel, also continuing to further depresses the hammer.

Still images pulled from FRT Full Video animation on Rare Breed Triggers web site. Note that image on the left within blue box depicts a standard AR15-type semiautomatic trigger mechanism. Image on the right within red box depicts the FRT-15 trigger mechanism. ATF highlights added.

AR15 Semiautomatic



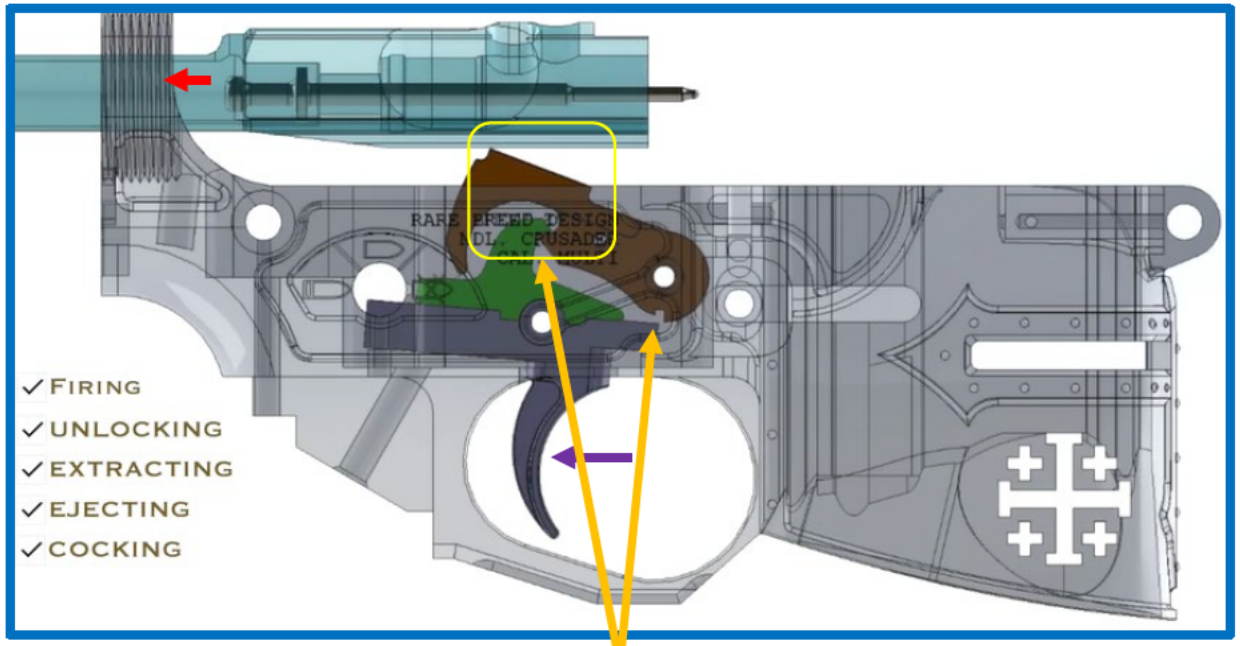
FRT-15



The spent case is drawn out of the chamber, the spring-loaded ejector, acting against the left side of the case head, pushes the spent case out of the ejection port. The bolt carrier group continues rearward still depressing the hammer.

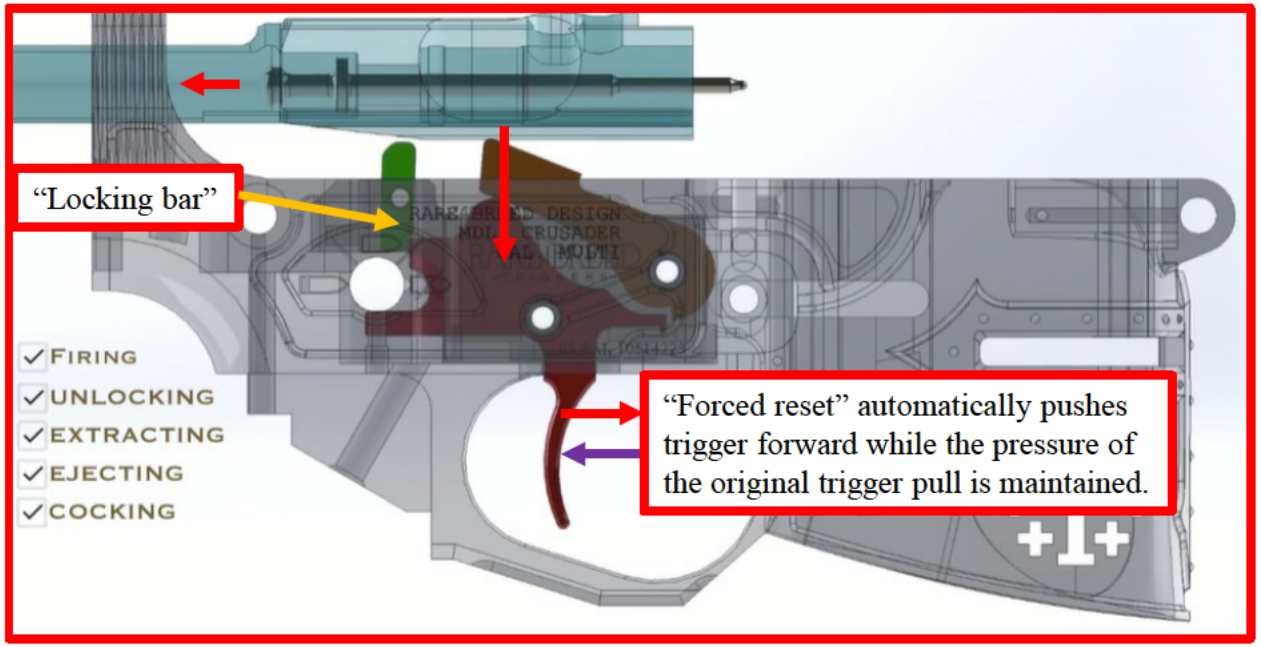
Still images pulled from FRT Full Video animation on Rare Breed Triggers web site. Note that image on the left within blue box depicts a standard AR15-type semiautomatic trigger mechanism. Image on the right within red box depicts the FRT-15 trigger mechanism. ATF highlights added.

AR15 Semiautomatic



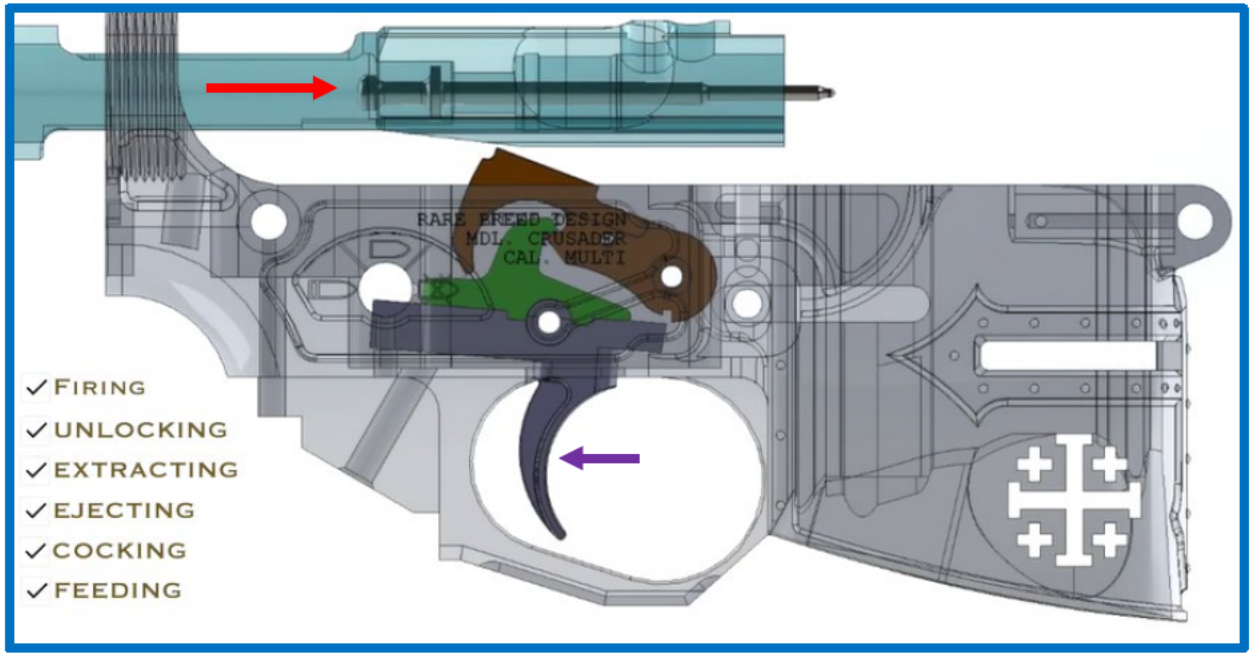
As the bolt carrier group continues rearward to recoil, it compresses the action spring and cocks the hammer. In a semiautomatic AR15-type rifle, when the trigger is pulled, the firing action of the rifle is generally much faster than human reaction, so a "disconnector" is employed to retain the hammer in a cocked position for the remainder of the operating cycle, thus limiting the weapon to firing one shot, without manual reloading, by a single function (pull) of the trigger

FRT-15



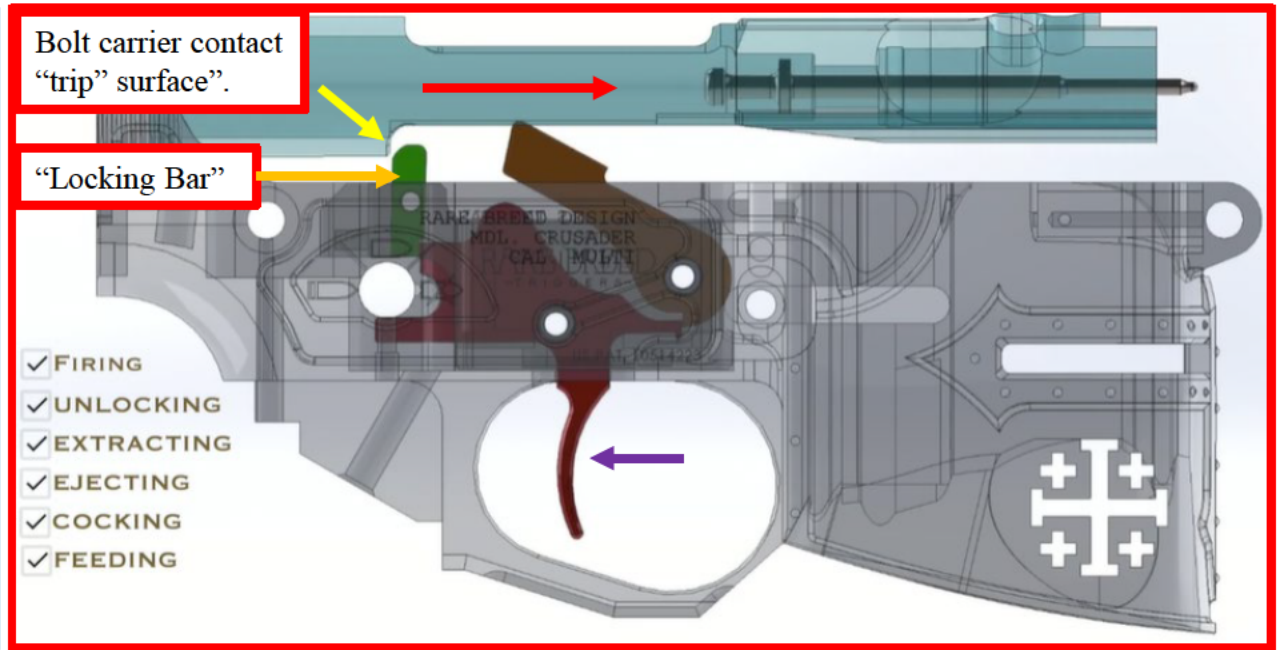
In the FRT-15 equipped firearm, as the bolt carrier group continues rearward to recoil also compressing the action spring, hammer contact with the bolt carrier group pushes down on the trigger which forces it forward allowing the "locking bar" to momentarily keep the trigger in place so that the shooter may not override the timing of the automatic functioning of the weapon. Note that it is possible to retain the pressure from the single function (pull) of the trigger during this self-acting or self-regulating phase of the mechanism's operation, as it is with the semiautomatic AR15 (left), though with different results as the firearm goes into battery on a subsequent cartridge later in the operating cycle.

AR15 Semiautomatic



With pressure still maintained from the original continuous function (pull) of the trigger the hammer remains in a cocked position, still retained by the disconnector. The action spring drives the bolt carrier group forward. As the bolt carrier group moves forward, the lugs of the bolt pick up a cartridge from the magazine and feed it into the chamber. As the bolt locking lugs enter the barrel extension, the ejector is compressed against the left side of the cartridge head, and the extractor snaps into the extractor grove on the cartridge.

FRT-15

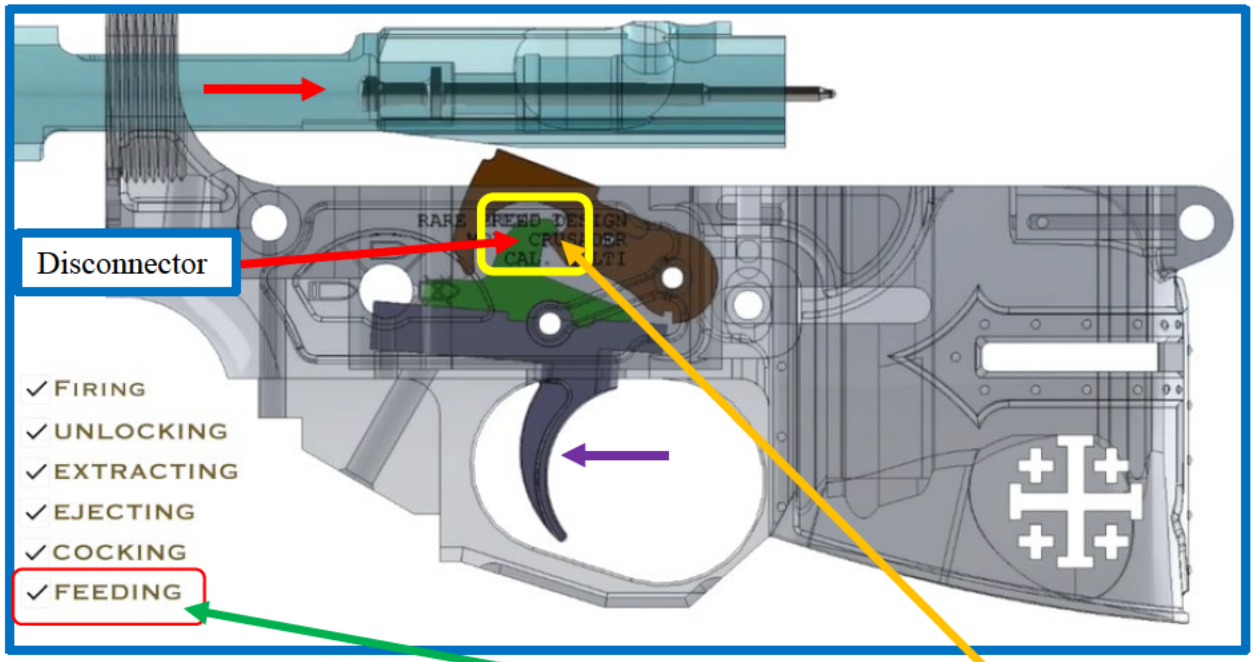


With pressure still maintained from the original continuous function (pull) of the trigger, the trigger is momentarily kept the forward position into which it was automatically placed by the self-acting or self-regulating mechanism (until the "locking bar" is struck by the "trip" surface on the M-16 "machinegun" type bolt carrier). This surface on the M-16 type bolt carrier is designed to interact with the automatic sear to effect automatic fire in "machinegun" variants of this operating system and serves no purpose in standard semiautomatic AR15-type firearms. The remainder of the feeding cycle remains similar. The action spring drives the bolt carrier group forward. As the bolt carrier group moves forward, the lugs of the bolt pick up a cartridge from the magazine and feed it into the chamber. As the bolt locking lugs enter the barrel extension, the ejector is compressed against the left side of the cartridge head, and the extractor snaps into the extractor groove on the cartridge.

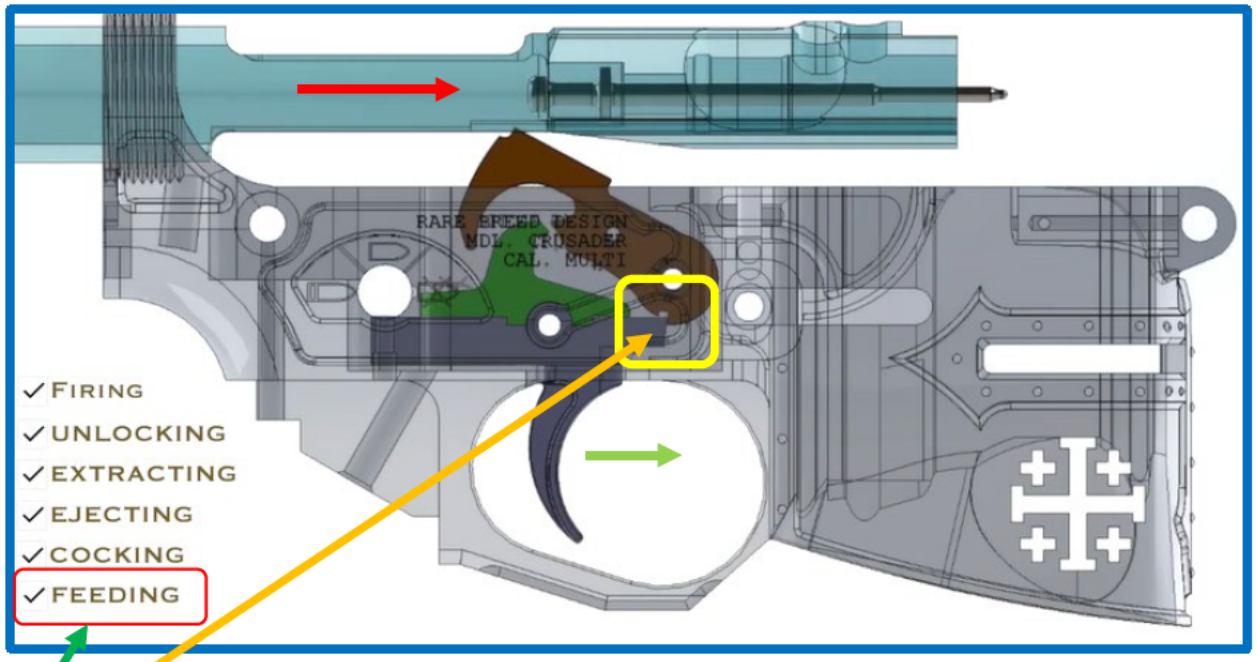
ATF0267

Still images pulled from FRT Full Video animation on Rare Breed Triggers web site. Note that image on the left within blue box depicts a standard AR15-type semiautomatic trigger mechanism. Image on the right within red box depicts the FRT-15 trigger mechanism. ATF highlights added.

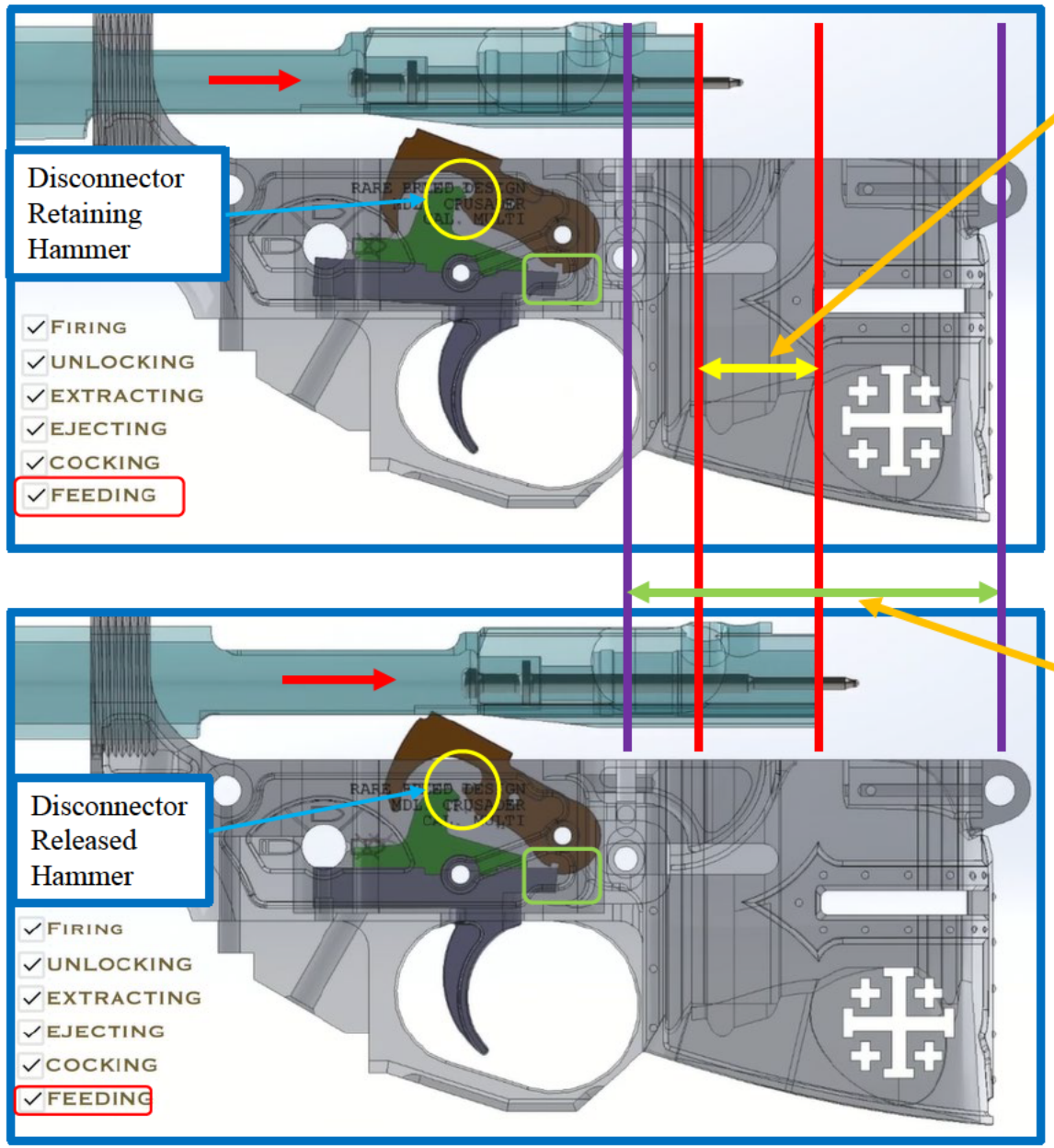
AR-15 Semiautomatic



AR-15 Semiautomatic



The Rare Breed video animation depicts the standard semiautomatic AR15-type firing mechanism as moving from having the disconnector retaining the hammer (left view) in a cocked position, to having the trigger sear retaining the hammer in a cocked position (right view) during the "feeding" cycle. The video states that the shooter may release the trigger at this point to allow the trigger to reset. It is significant to note that for this to occur during at this point of the operating cycle, the shooter would be required to physically release the trigger within a fraction of a second after firing, unlike with the FRT-15, which does this automatically through its self-acting or self-regulating mechanism. See Wolf Tactical LLC U.S. Patent No.: 10,514,223 reference on next slide.



Approximate portion of bolt carrier assembly travel distance (forward stroke between red vertical lines), within overall operating cycle, that standard AR15 semiautomatic manual trigger release/reset is depicted within Rare Breed animation video.

To further explain the previous slide, the Rare Breed video states that a standard "mil-spec." AR-15 trigger can be released by the shooter to reset the trigger at this point. To duplicate what is happening at this point of the operating cycle, the shooter would be required to physically release the trigger within a fraction of a second after firing, unlike with the FRT-15, which does this automatically through its self-acting or self-regulating mechanism.

This is a small fraction of time within the overall duration of the operating cycle (incorporating rearward and forward movement) which in its entirety takes only a fraction of a second in and of itself. This appears to have been done to "sync" the position of the of a standard semiautomatic trigger with that of the FRT-15 trigger at the same point of the operating cycle in the Rare Breed FRT-15 video animation.

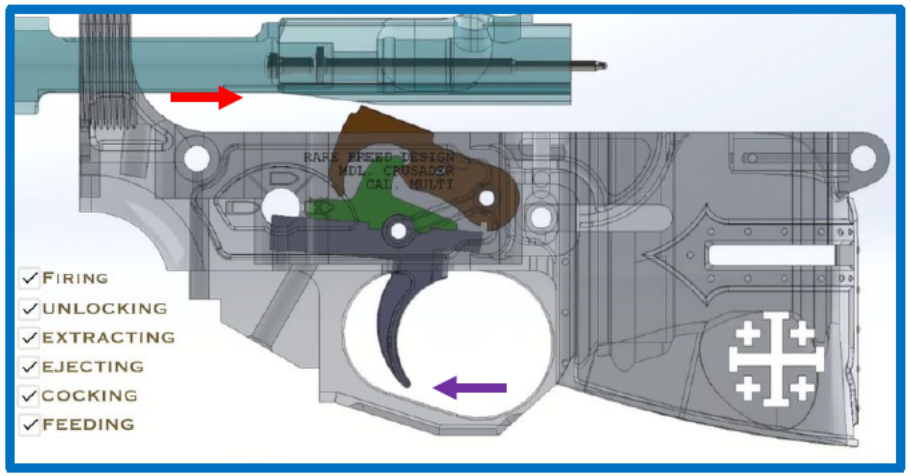
Approximate overall bolt carrier assembly travel distance (both rearward and forward strokes between purple lines) during entire operating cycle.

This phenomena is mentioned within Wolf Tactical LLC U.S. Patent No.: 10,514,223 B1.

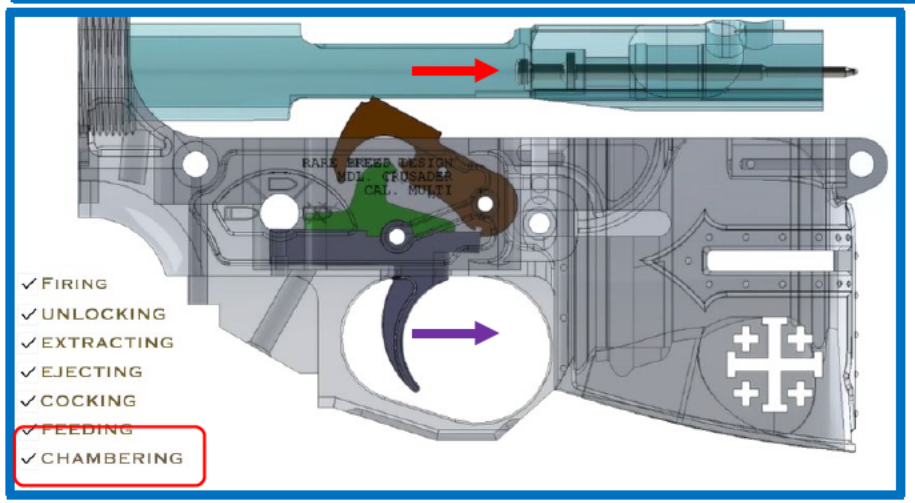
" A standard semiautomatic trigger mechanism includes a disconnector, which holds the hammer or striker in a cocked position until the trigger member is reset to engage the sear. This allows the firearm to be fired only a single time when the trigger is pulled and held, because the user is not typically able to release the trigger rapidly enough so that the sear engages before the bolt or bolt carrier returns to the in-battery position. The disconnector prevents the firearm from either firing multiple rounds on a single pull of the trigger, or allowing the hammer or striker to simply "follow" the bolt as it returns to battery without firing a second round, but leaving the hammer or striker uncocked."

ATF0269

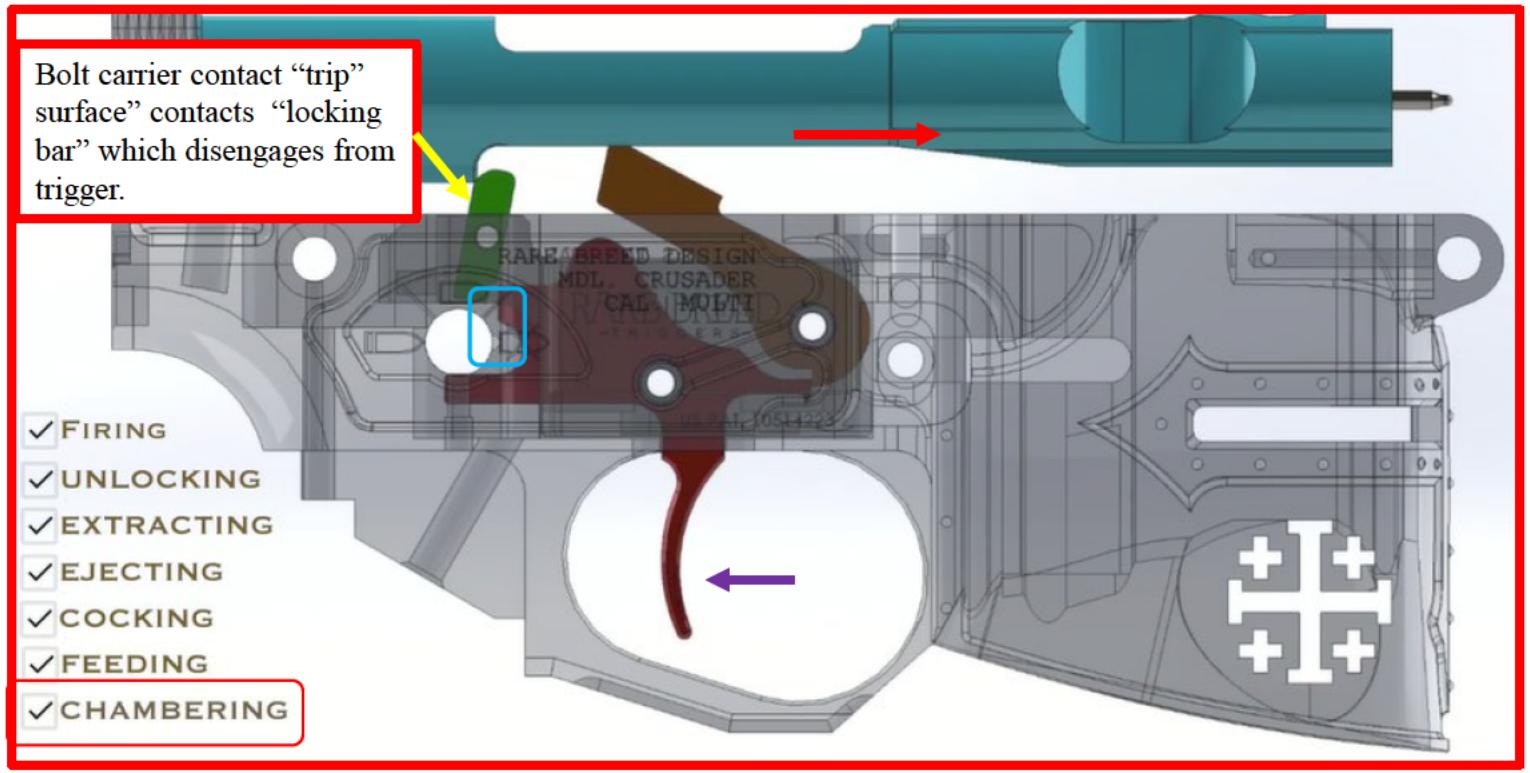
AR-15 Semiautomatic



ATF notes for the reasons outlined in the previous two slides that during the "feeding" portion of the AR15 semiautomatic operating cycle, the trigger is most commonly still being retained to the rear with the hammer retained by the disconnector (top view) than as depicted below.



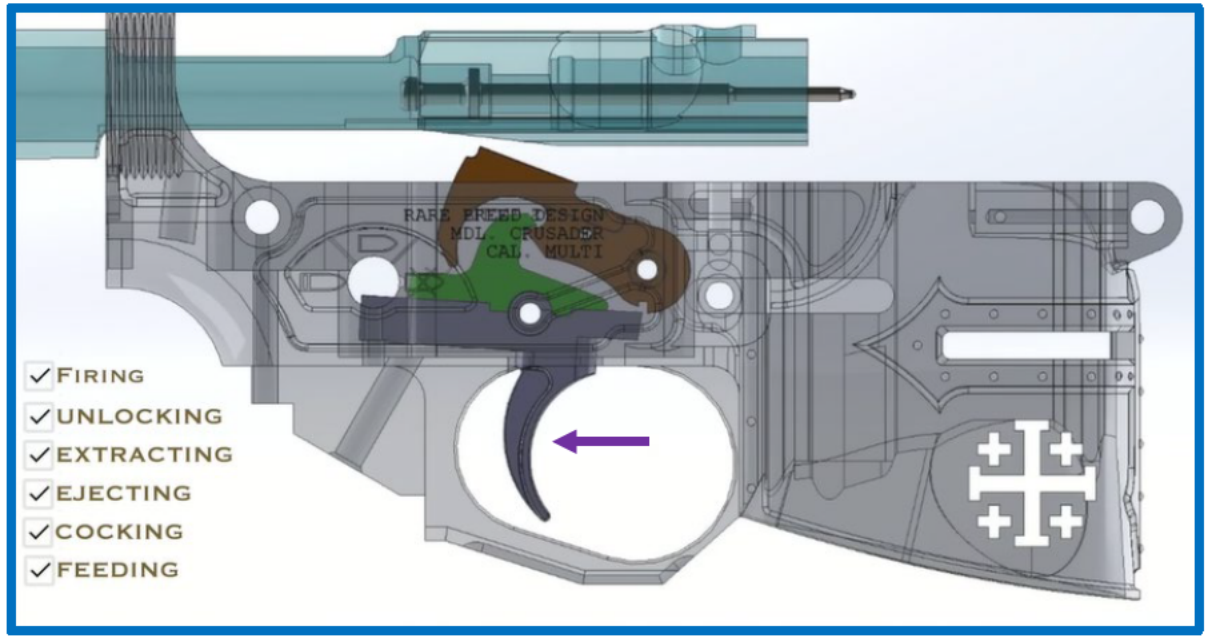
FRT-15



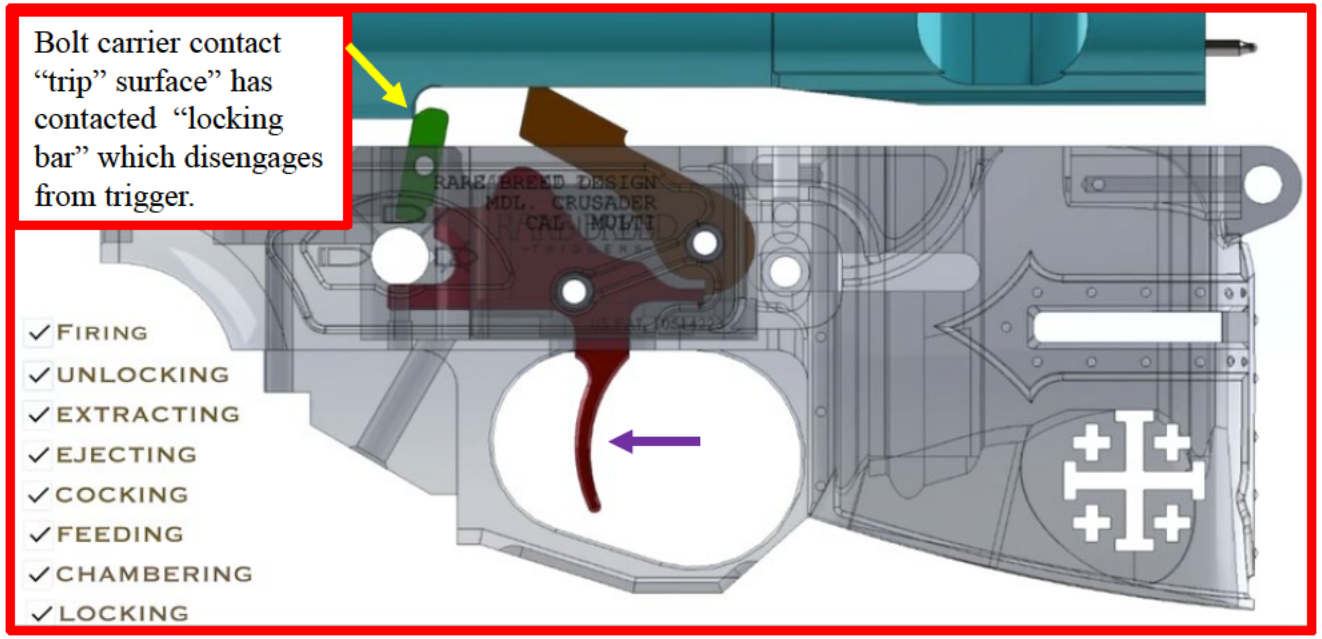
With pressure still maintained from the original continuous function (pull) of the trigger, the trigger, which was momentarily kept in the forward position into which it was automatically forced, is now free to fire subsequent shots with continuous pressure from the original function (pull) of the trigger, due to the self-acting or self-regulating mechanism. The "locking bar" performs a timed delay function which is automatically disengaged during the operating cycle of the firearm, rather than a positive disconnect, as does the standard AR15-type disconnector pictured in images at left.

Still images pulled from FRT Full Video animation on Rare Breed Triggers web site. Note that image on the left within blue box depicts a standard AR15-type semiautomatic trigger mechanism. Images on the right within red box depicts the FRT-15 trigger mechanism. ATF highlights added.

AR15 Semiautomatic



FRT-15



If pressure applied during the initial function (pull) of the trigger is continuously maintained after firing the first shot (see Wolf Tactical LLC patent excerpt on slide 21) during the operating cycle of the firearm, the standard AR15 does not fire a subsequent shot with the original single function (pull) of the trigger. The shooter is required to both manually release and pull the trigger to fire another shot. Even if the shooter does manage to physically release the trigger during the operating cycle of the firearm to reset the trigger, an additional "pull" is required to fire another shot.

If pressure applied during the initial function (pull) of the trigger is continuously maintained after firing the first shot during the operating cycle of the FRT-15 equipped firearm, the self-acting or self-regulating mechanism will automatically force the trigger forward into the shooters finger thus "resetting" the trigger (with the original function (pull) of the trigger being maintained, subsequent shots are fired each time the momentary timed delay provided by the "locking bar" is removed as it is impacted or "tripped" by a surface present on the required M16-type machinegun bolt carrier designed to preform that function om M16-type machineguns during the firearms operating cycle.

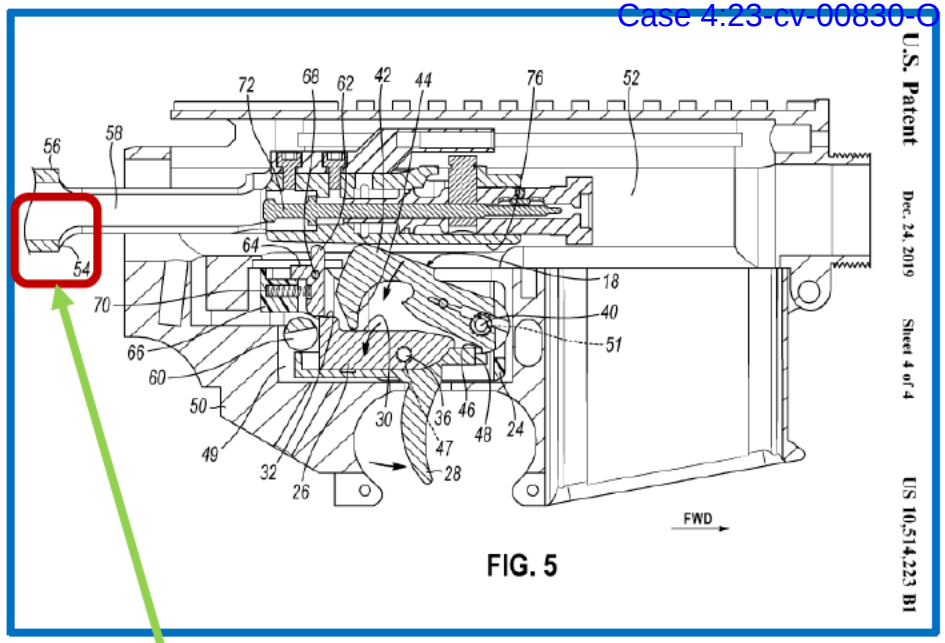


FIG. 5

Wolf Tactical LLC Patent Images

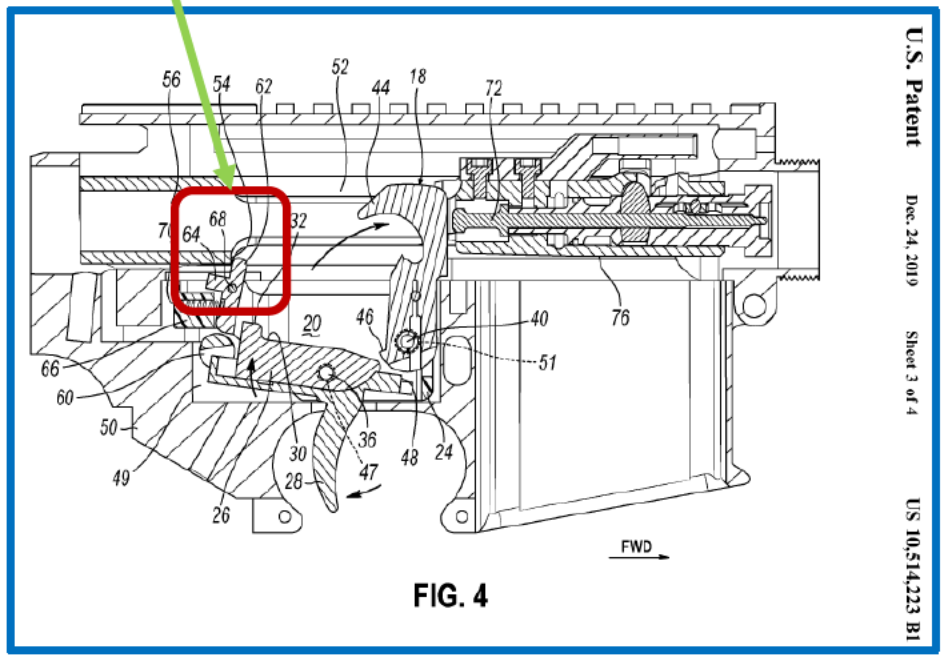
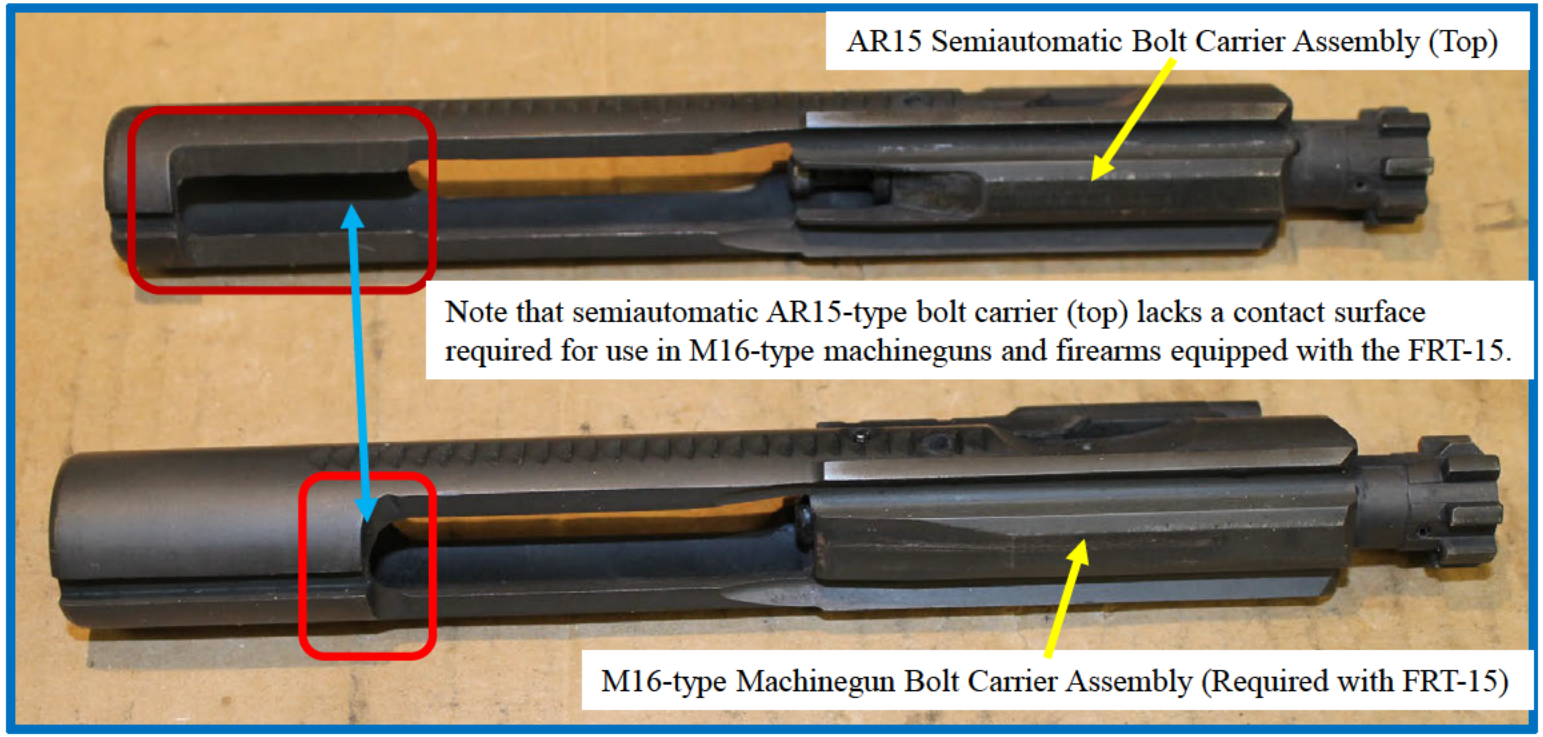


FIG. 4



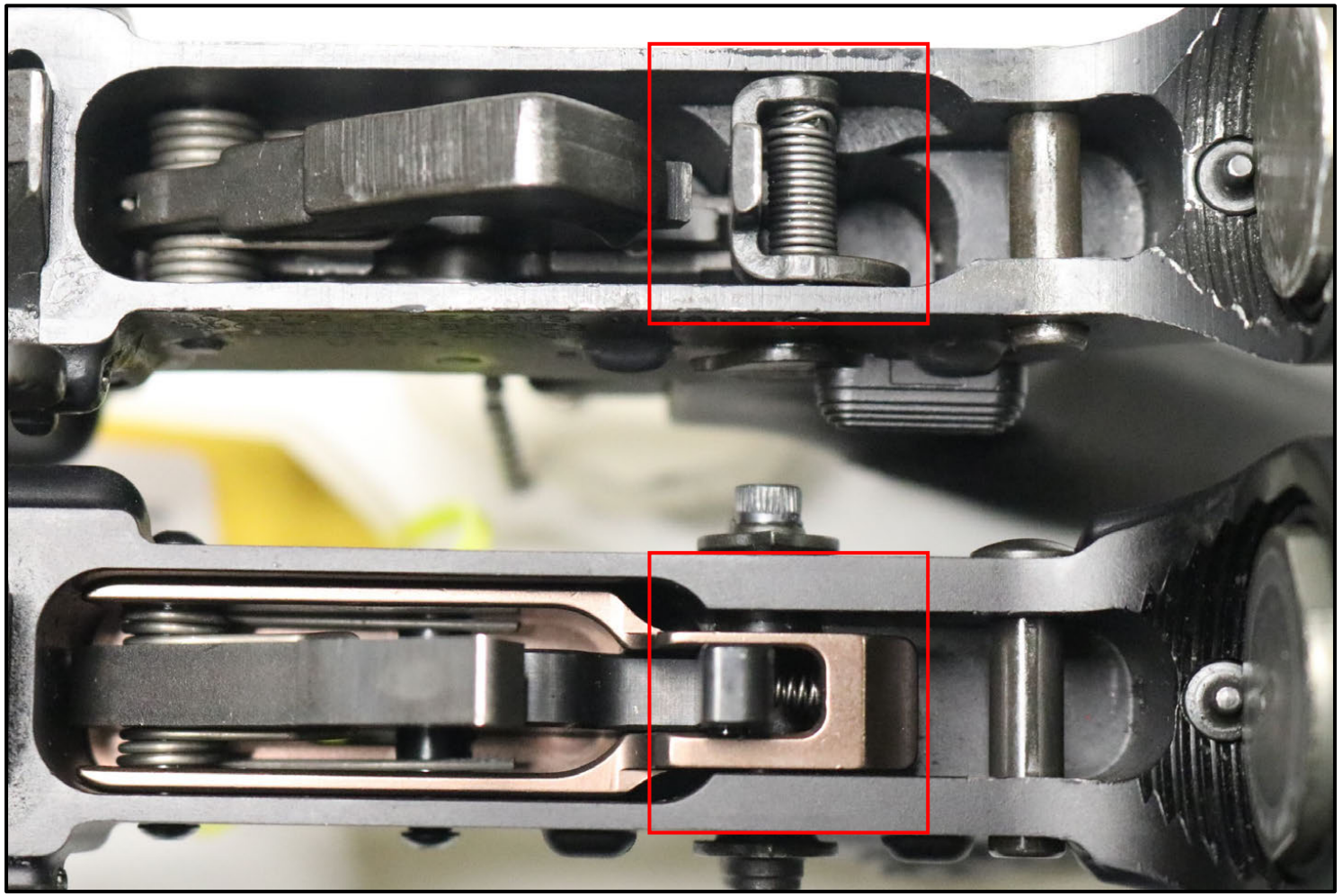
The FRT-15 requires the use of an M16-type machinegun bolt carrier which incorporates a contact surface designed to "trip" the automatic sear in an M16-type machinegun to effect automatic fire, this same contact surface is required to "trip" the "locking bar" on the FRT-15 mechanism during the operating cycle of the firearm. Wolf Tactical LLC U.S. Patent .: 10,514,223 B1 includes the following in 4, 50 and 55:

*"The bolt carrier assembly **52** used with the embodiments of this invention can be an ordinary (mil-spec) M16-pattern bolt carrier assembly, whether operated by direct impingement or a gas piston system, that has a bottom cut position to engage an auto sear in a fully automatic configuration. The bottom cut creates an engagement surface **54** in the tail portion **56** of the bolt carrier body **58**. This is distinct from a modified AR15 bolt carrier that is further cut-away so that engagement with an auto sear is impossible."*

Emphasis in red added by ATF.

ATF0272

Exhibit 42 Installed in NFC DDM4 (bottom) Compared to NFC M4 Machinegun (top)



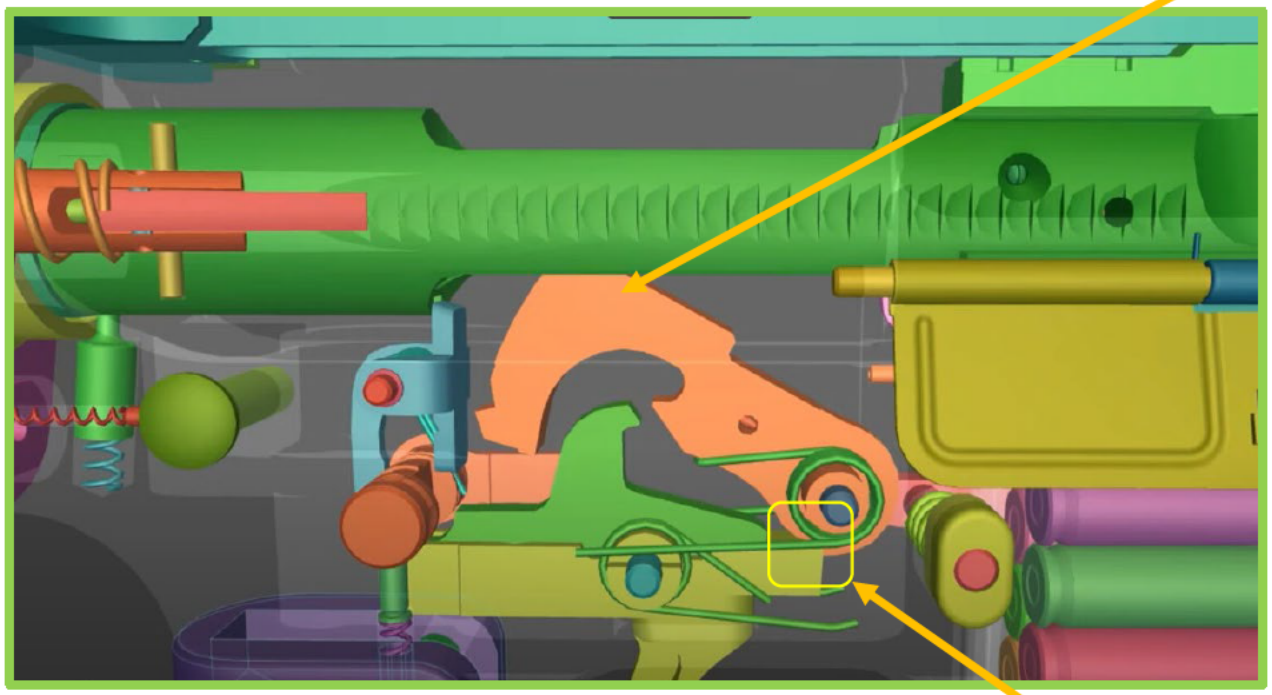
Both firearms require that an M16-type machinegun bolt carrier be utilized to function as designed. The M16-type machinegun carrier trips both the “locking bar” on the FRT-15 equipped firearm and the automatic sear on the M16-type machinegun to effect automatic fire.

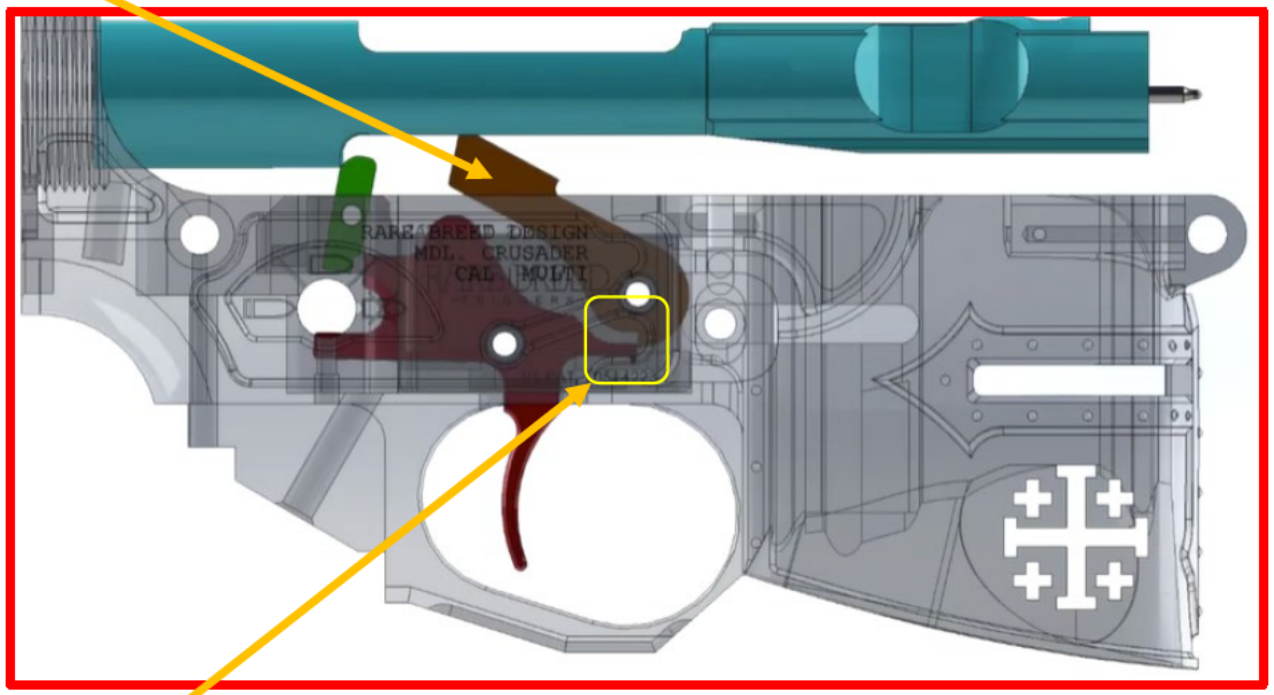
Still images on the right of the FRT-15 pulled from FRT Full Video animation on Rare Breed Triggers web site. Note that image on the left within green box depicts a standard M16-type machinegun trigger mechanism. Image on the right within red box depicts the FRT-15 trigger mechanism. ATF highlights added.

M16-TYPE MACHINEGUN

Hammer

FRT-15



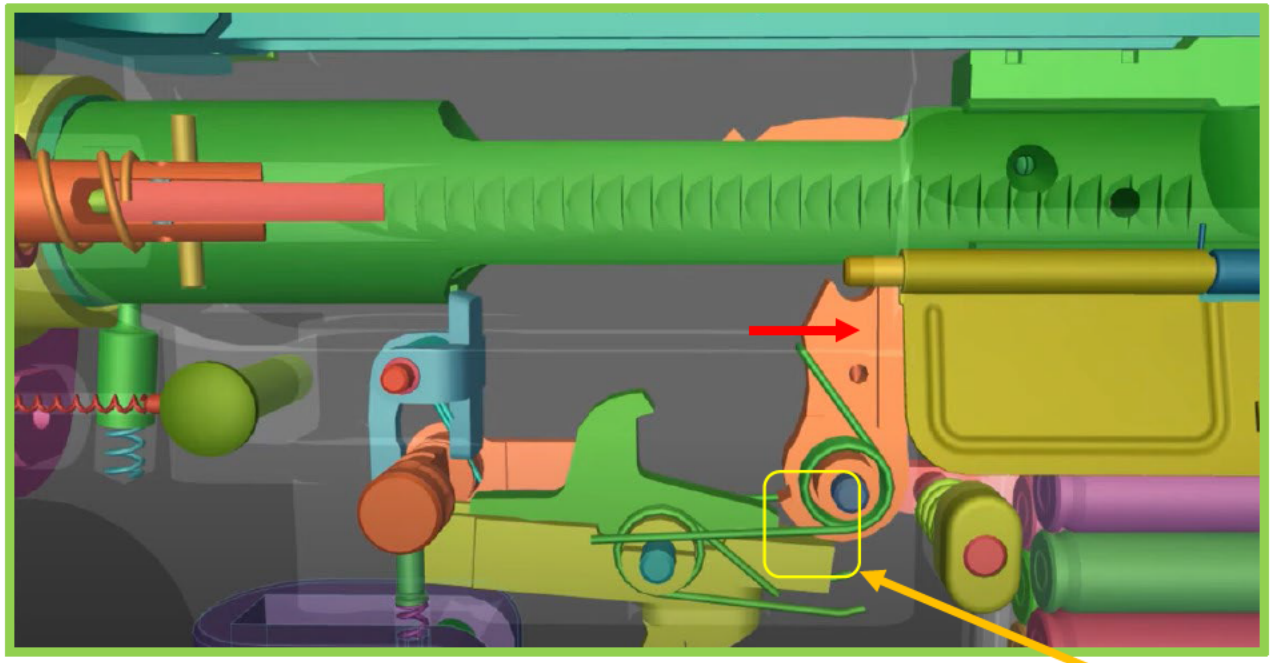


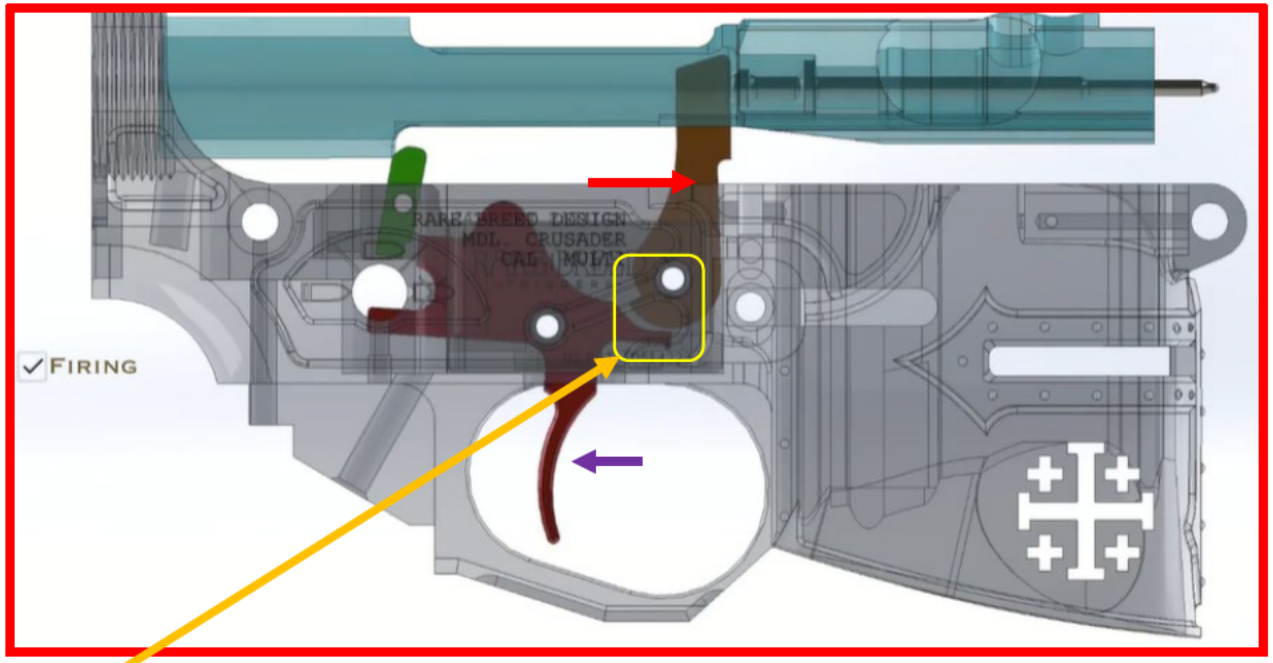
When the trigger is first pulled with the weapon in battery having a cartridge chambered, it causes the sear (located on the front of the trigger), to release the hammer

Still images on the right of the FRT-15 pulled from FRT Full Video animation on Rare Breed Triggers web site. Note that image on the left within green box depicts a standard M16-type machinegun trigger mechanism. Image on the right within red box depicts the FRT-15 trigger mechanism. ATF highlights added.

M16-TYPE MACHINEGUN

FRT-15

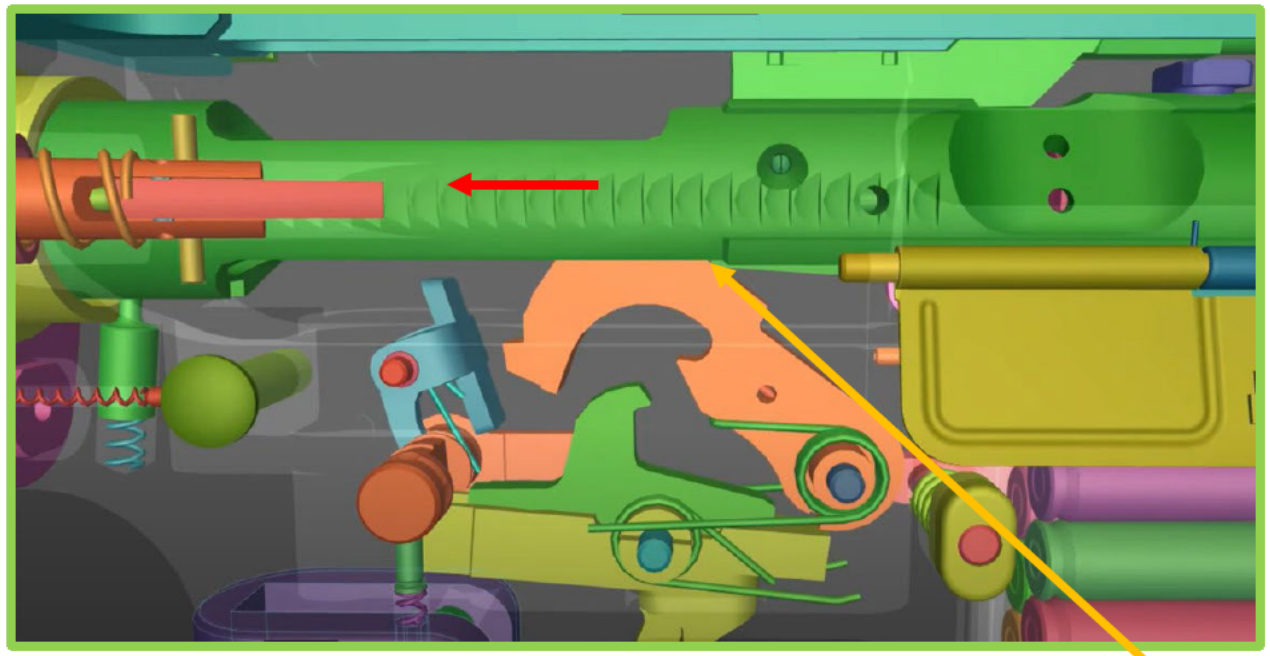




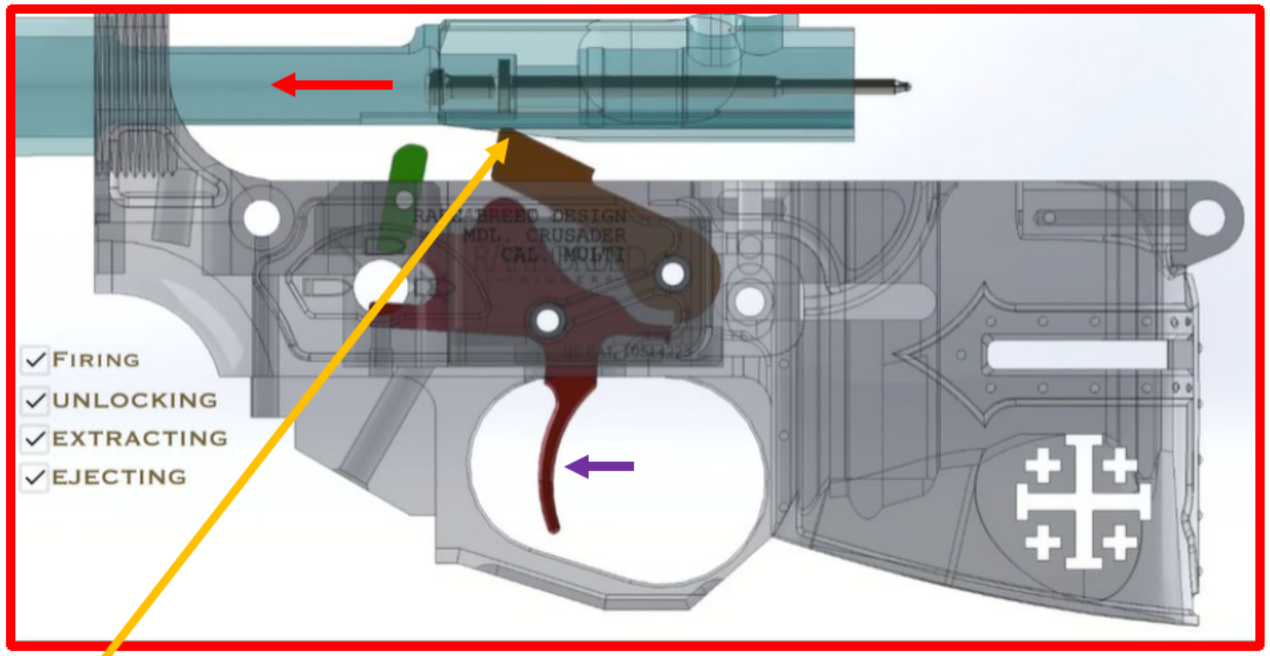
View of both the M16-type machinegun (left), and the FRT-15 equipped firearm (right) having the trigger pulled to the rear. The sear, now clear of the hammer, allows the hammer to fall, striking the firing pin and firing the chambered cartridge.

Still images on the right of the FRT-15 pulled from FRT Full Video animation on Rare Breed Triggers web site. Note that image on the left within green box depicts a standard M16-type machinegun trigger mechanism. Image on the right within red box depicts the FRT-15 trigger mechanism. ATF highlights added.

M16-TYPE MACHINEGUN



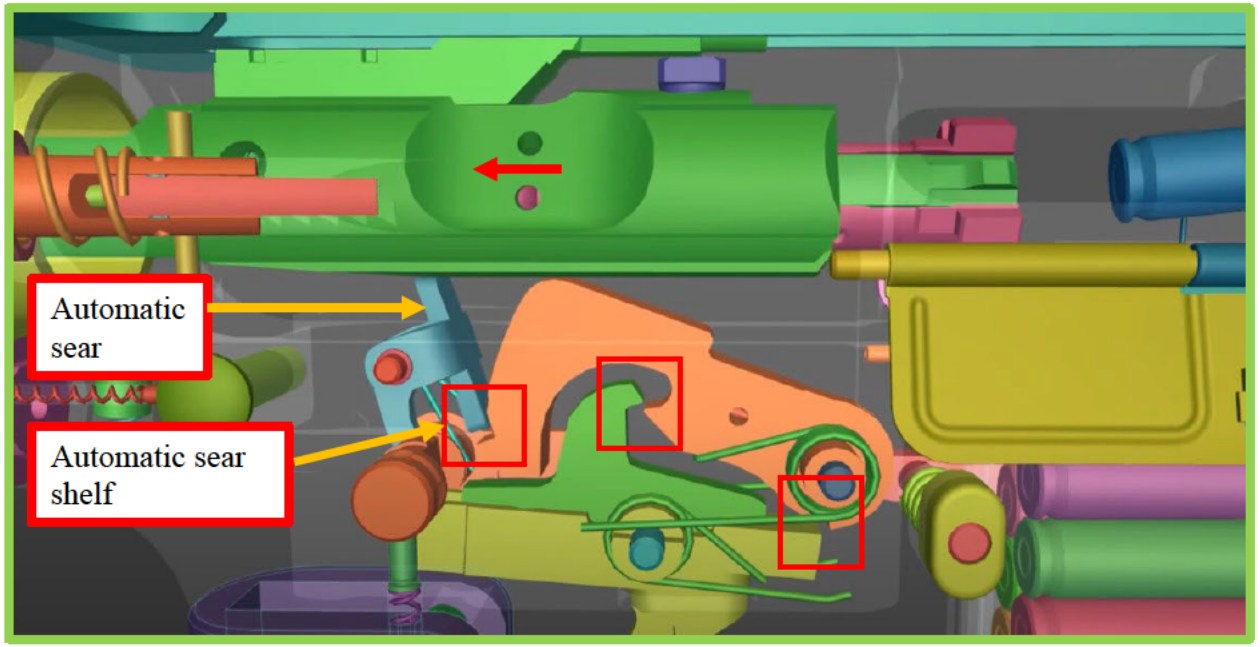
FRT-15



The spent case is drawn out of the chamber, the spring-loaded ejector, acting against the left side of the case head, pushes the spent case out of the ejection port. The M16-type bolt carrier group continues rearward still depressing the hammer.

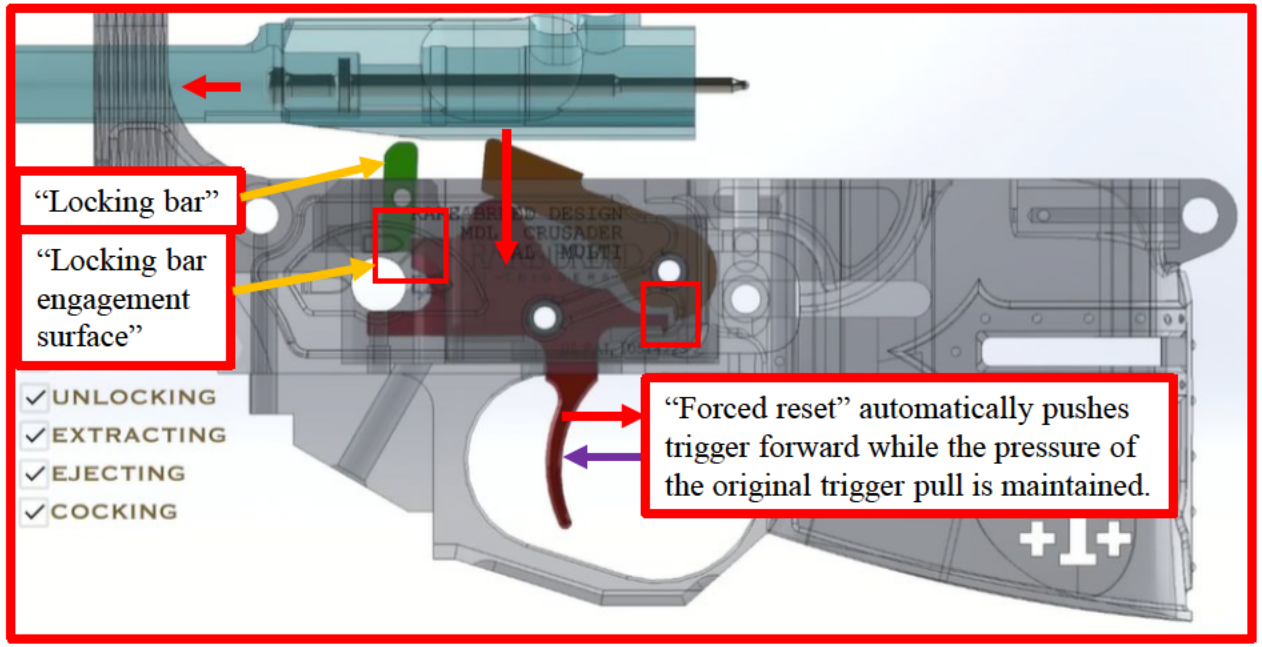
Still images on the right of the FRT-15 pulled from FRT Full Video animation on Rare Breed Triggers web site. Note that image on the left within green box depicts a standard M16-type machinegun trigger mechanism. Image on the right within red box depicts the FRT-15 trigger mechanism. ATF highlights added.

M16-TYPE MACHINEGUN



As the M16-type bolt carrier group continues to recoil rearward, it compresses the action spring and cocks the hammer. In a M16-type machinegun, with the selector is rotated to the "automatic" position, it depresses the disconnector thus preventing it from contacting the sear surface of the hammer. When the trigger is pulled, the hammer is released by the sear surface of the front of the trigger that contacts the sear notch on the hammer. When the bolt moves rearward, it pushes the hammer down allowing the automatic sear to engage the automatic sear shelf on the hammer and is the only mechanism holding the hammer in place this time and is effectively timing the hammer to fall once the bolt has moved forward into battery.

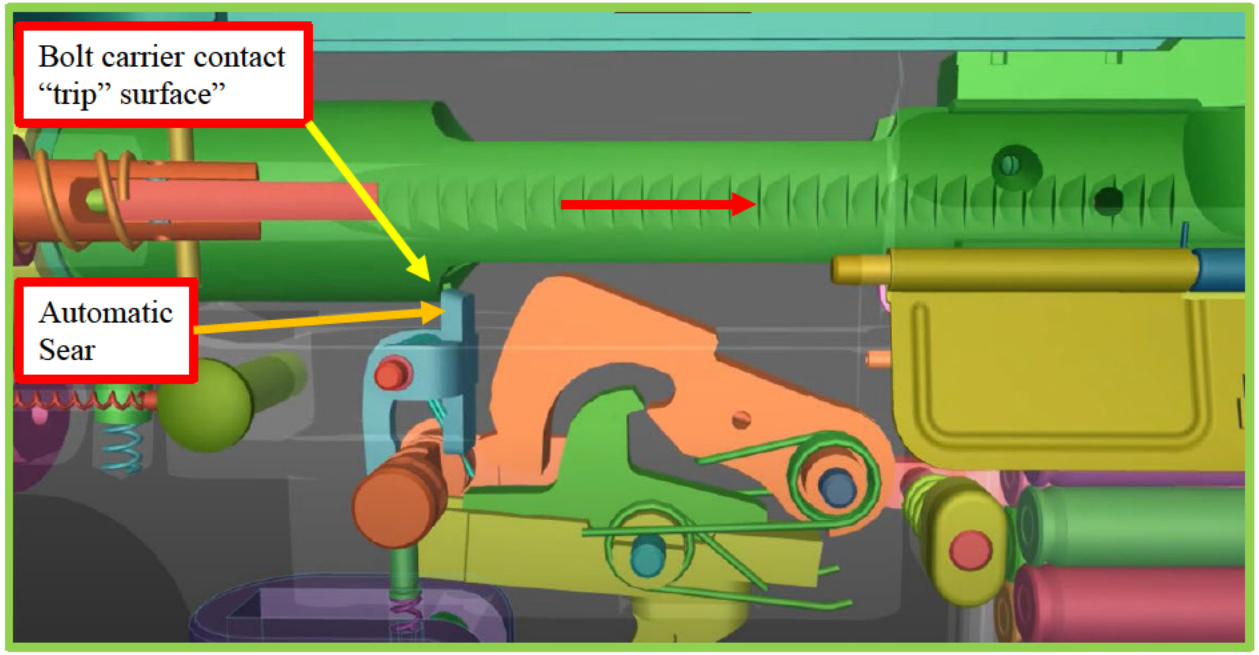
FRT-15



In the FRT-15 equipped firearm, as the M16-type bolt carrier group continues rearward to recoil also compressing the action spring, hammer contact with the bolt carrier group pushes down on the upper lobe of the trigger which forces it forward allowing the "locking bar" to momentarily time the trigger by keeping it in place so that the shooter may not override the timing of the automatic functioning of the weapon. Note that it is possible to retain the pressure from the single function (pull) of the trigger during this self-acting or self-regulating phase of the mechanism's operation, as it is with a semiautomatic AR-15, though with different results as the firearm goes into battery on a subsequent cartridge later in the operating cycle which is similar to the M16 machinegun (left).

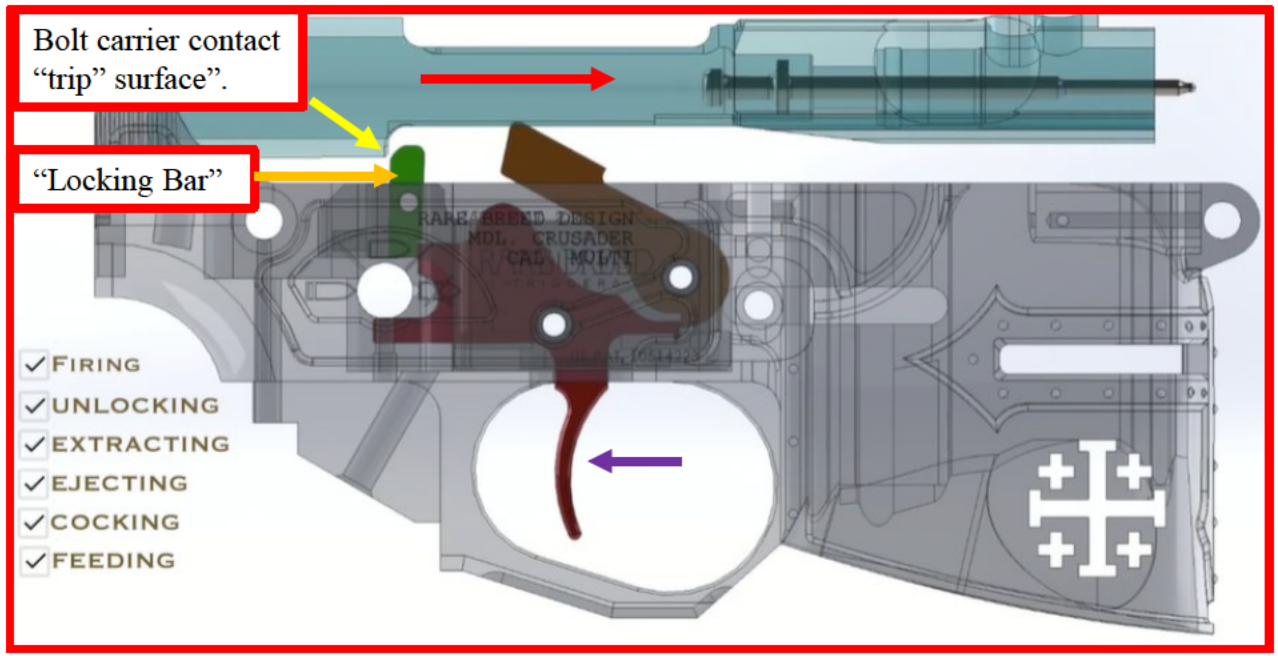
Still images on the right of the FRT-15 pulled from FRT Full Video animation on Rare Breed Triggers web site. Note that image on the left within green box depicts a standard M16-type machinegun trigger mechanism. Image on the right within red box depicts the FRT-15 trigger mechanism. ATF highlights added.

M16-TYPE MACHINEGUN



With pressure still maintained from the original continuous function (pull) of the trigger, the hammer remains in a cocked position, still retained by the automatic sear. The action spring drives the bolt carrier group forward. As the bolt carrier group moves forward, the lugs of the bolt pick up a cartridge from the magazine and feed it into the chamber. As the bolt locking lugs enter the barrel extension, the ejector is compressed against the left side of the cartridge head, and the extractor snaps into the extractor groove on the cartridge. At this time, the "trip" surface on the M16-type bolt carrier interacts with the automatic sear (releasing the automatic sear from the automatic sear shelf of the hammer) to effect automatic fire. The remainder of the feeding cycle remains similar.

FRT-15



With pressure still continuously maintained from the original continuous function (pull) of the trigger. At this time, the trigger is still being held reward but is momentarily kept in the forward position into which it was automatically placed by the self-acting or self-regulating mechanism until the "locking bar" is struck by the "trip" surface on the M16-type bolt carrier that was designed to interact with the automatic sear to effect automatic fire in "machinegun" variants of this operating system and serves no purpose in semiautomatic AR15-type firearms. The remainder of the feeding cycle remains similar. The action spring drives the bolt carrier group forward. As the bolt carrier group moves forward, the lugs of the bolt pick up a cartridge from the magazine and feed it into the chamber. As the bolt locking lugs enter the barrel extension, the ejector is compressed against the left side of the cartridge head, and the extractor snaps into the extractor groove on the cartridge.

US010514223B1

(12) **United States Patent**
Rounds

(10) **Patent No.: US 10,514,223 B1**
(45) **Date of Patent: Dec. 24, 2019**

(54) **FIREARM TRIGGER MECHANISM**

(71) Applicant: **Wolf Tactical LLC**, Buda, TX (US)

(72) Inventor: **Jeffrey Cooper Rounds**, Buda, TX (US)

(73) Assignee: **Wolf Tactical LLC**, Buda, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/143,624**

(22) Filed: **Sep. 27, 2018**

Related U.S. Application Data

(60) Provisional application No. 62/565,247, filed on Sep. 29, 2017.

(51) **Int. Cl.**

F41A 19/43	(2006.01)
F41A 19/14	(2006.01)
F41A 19/10	(2006.01)
F41A 19/12	(2006.01)
F41A 17/82	(2006.01)

(52) **U.S. Cl.**
CPC ***F41A 19/43*** (2013.01); ***F41A 19/10*** (2013.01); ***F41A 19/12*** (2013.01); ***F41A 19/14*** (2013.01); *F41A 17/82* (2013.01)

(58) **Field of Classification Search**
CPC F41A 19/10; F41A 19/12; F41A 19/14; F41A 19/43; F41A 17/82
USPC 89/136, 139; 42/69.01, 69.02, 69.03
See application file for complete search history.

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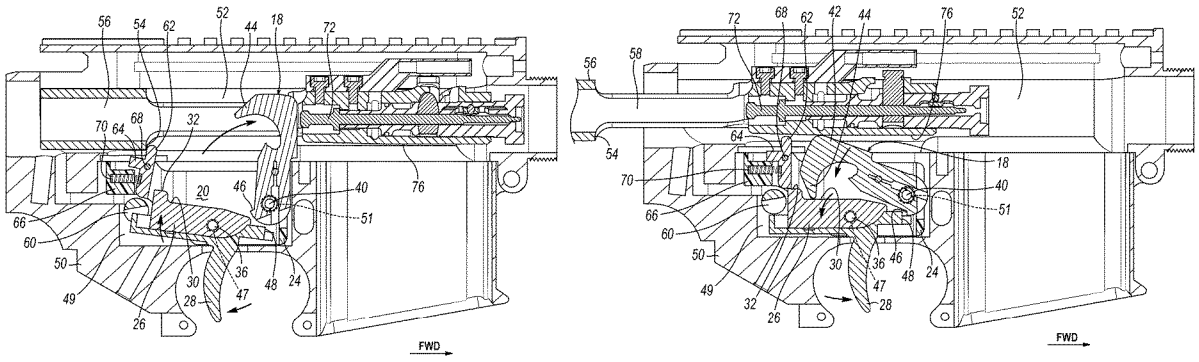
Primary Examiner — Bret Hayes
(74) *Attorney, Agent, or Firm* — Wood Herron & Evans LLP

(57) **ABSTRACT**

A trigger mechanism for use in a firearm having a receiver with a fire control mechanism pocket, transversely aligned pairs of hammer and trigger pin openings in the pocket, and a bolt carrier that reciprocates and pivotally displaces a hammer when cycled. The trigger mechanism includes a hammer, a trigger member, and a locking bar. The hammer has a sear notch and is mounted in the fire control mechanism pocket to pivot on a transverse hammer pin between set and released positions. The trigger member has a sear and is mounted in the fire control mechanism pocket to pivot on a transverse trigger pin between set and released positions. The trigger member has a surface positioned to be contacted by hammer when the hammer is displaced by cycling of the bolt carrier, the contact causing the trigger member to be forced to the set position. The locking bar is pivotally mounted in a frame and spring biased toward a first position in which it mechanically blocks the trigger member from moving to the release position, and is movable against the spring bias to a second position when contacted by the bolt carrier reaching a substantially in-battery position, allowing the trigger member to be moved by an external force to the released position.

7 Claims, 4 Drawing Sheets



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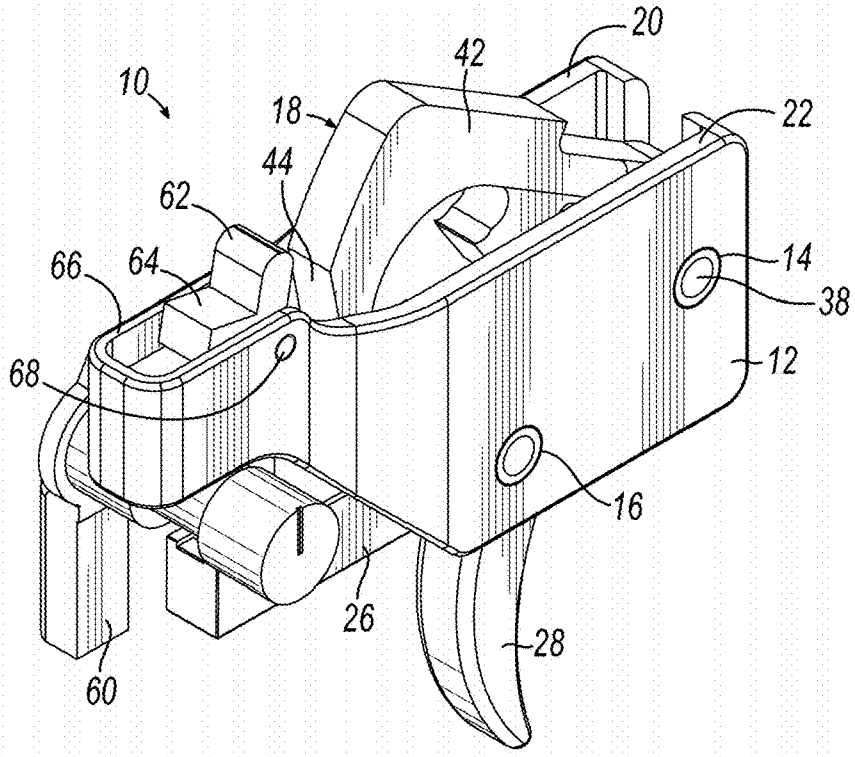
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FIG. 1

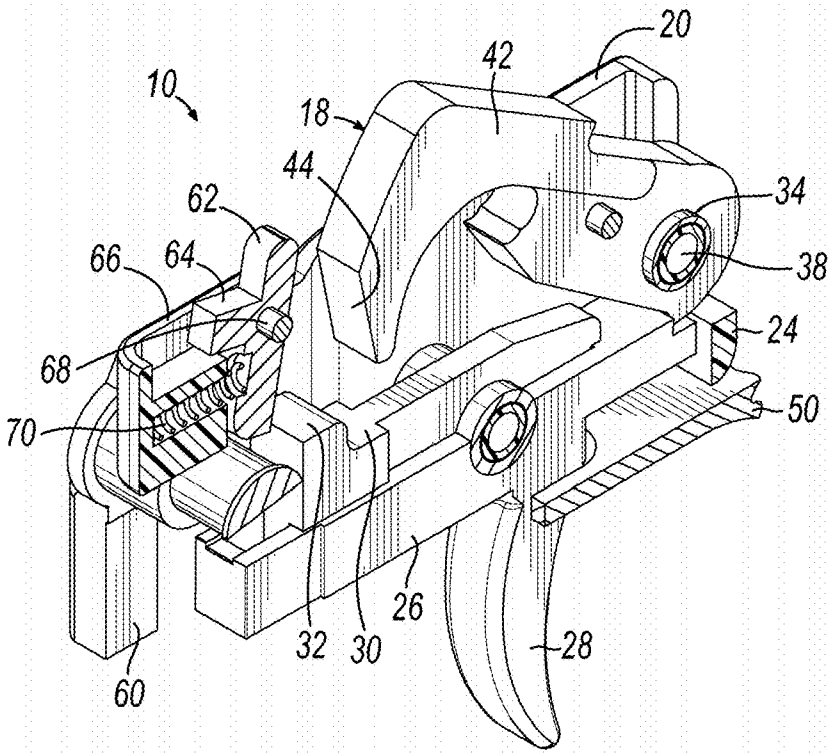
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FIG. 2

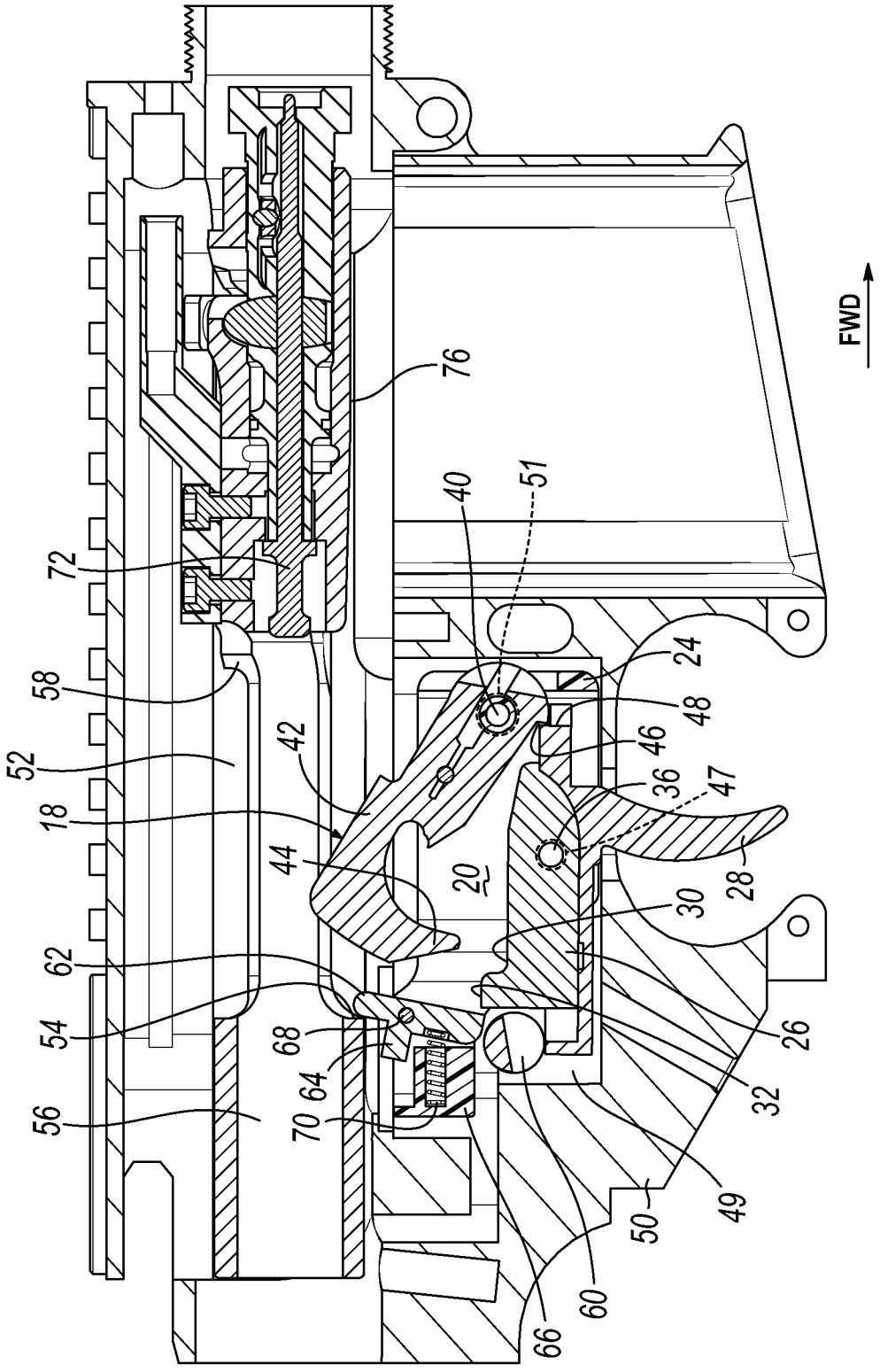
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FIG. 3

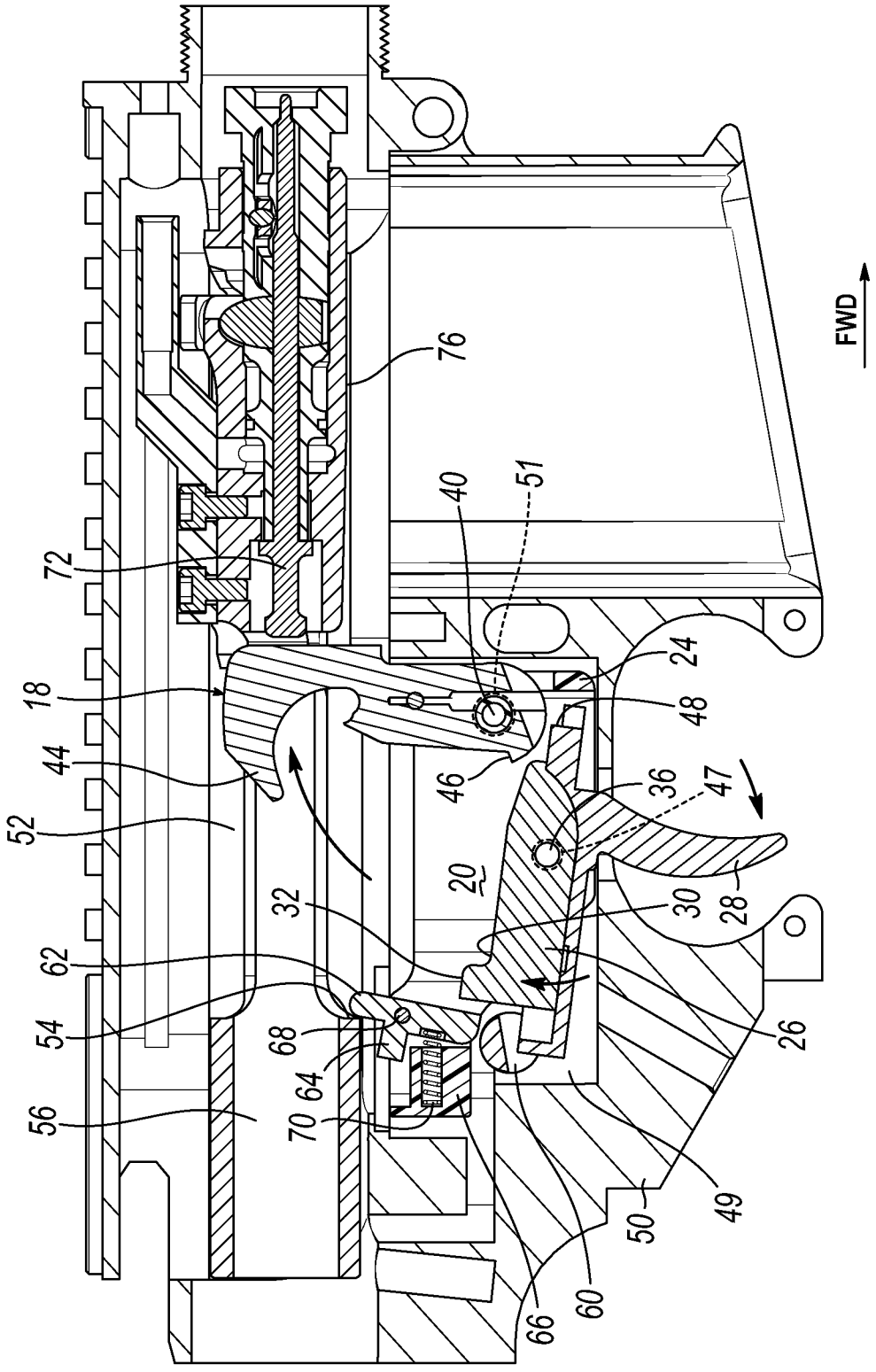
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FIG. 4

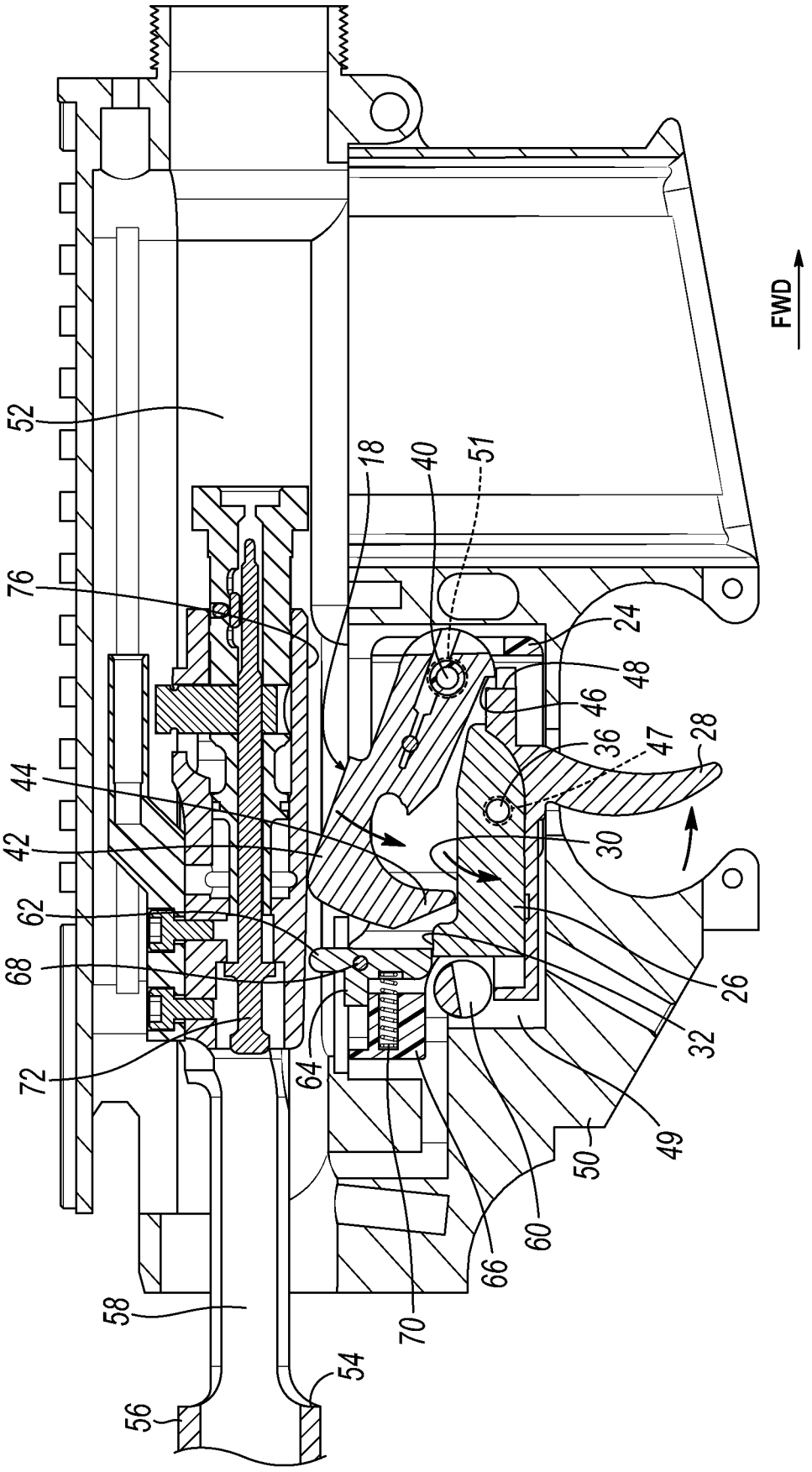
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FIG. 5

FIREARM TRIGGER MECHANISM

RELATED APPLICATIONS

This application claims priority to U.S. Provisional Patent Application No. 62/565,247 filed Sep. 29, 2017, and incorporates the same herein by reference.

TECHNICAL FIELD

This invention relates to a firearm trigger mechanism. More particularly, it relates to a semiautomatic trigger that is mechanically reset by movement of the hammer when it is reset by the bolt carrier.

BACKGROUND

In a standard semiautomatic firearm, actuation of the trigger releases a sear, allowing a hammer or striker to fire a chambered ammunition cartridge. Part of the ammunitions propellant force is used to cycle the action, extracting and ejecting a spent cartridge and replacing it with a loaded cartridge. The cycle includes longitudinal reciprocation of a bolt and/or carrier, which also resets the hammer or striker.

A standard semiautomatic trigger mechanism includes a disconnector, which holds the hammer or striker in a cocked position until the trigger member is reset to engage the sear. This allows the firearm to be fired only a single time when the trigger is pulled and held, because the user is not typically able to release the trigger rapidly enough so that the sear engages before the bolt or bolt carrier returns to its in-battery position. The disconnector prevents the firearm from either firing multiple rounds on a single pull of the trigger, or from allowing the hammer or striker to simply "follow" the bolt as it returns to battery without firing a second round, but leaving the hammer or striker uncocked.

For various reasons, shooters desire to increase the rate of semiautomatic fire. Sometimes this is simply for entertainment and the feeling of shooting a machine gun. In the past, users have been known to employ "bump firing" to achieve rapid semiautomatic fire. Bump firing uses the recoil of the semiautomatic firearm to fire shots in rapid succession. The process involves bracing the rifle with the non-trigger hand, loosening the grip of the trigger hand (but leaving the trigger finger in its normal position in front of the trigger), and pushing the rifle forward in order to apply pressure on the trigger from the finger while keeping the trigger finger stationary. When fired with the trigger finger held stationary, the firearm will recoil to the rear and allow the trigger to reset as it normally does. When the non-trigger hand pulls the firearm away from the body and back forward toward the original position, it causes the trigger to be pressed against the stationary finger again, firing another round as the trigger is pushed back.

Other devices have been offered that facilitate the bump fire process. One is shown in U.S. Pat. No. 6,101,918, issued Aug. 15, 2000, to William Akins for a Method and Apparatus for Accelerating the Cyclic Firing Rate of a Semiautomatic Firearm. This device, sold for some time as the Akins Accelerator™, allowed the receiver and action of the firearm to move longitudinally relative to the butt stock and used a spring to assist forward return movement. Other devices, such as that shown in U.S. Pat. No. 8,127,658, issued Mar. 6, 2012, and other patents owned by Slide Fire Solutions provide a replacement stock and handgrip assembly that facilitates bump firing, but without spring assistance.

Other solutions to increase the rate of semiautomatic fire include pull/release trigger mechanisms. These devices cause one round to be fired when the trigger is pulled and a second round to be fired when the trigger is released. Such a device is shown in U.S. Pat. No. 8,820,211, issued Sep. 2, 2014, entitled Selectable Dual Mode Trigger for Semiautomatic Firearms. A device like this is offered by FosTecH Outdoors, LLC as the ECHO TRIGGER™. Another device, offered by Digital Trigger Technologies, LLC under the name DigiTrigger™, provides a dual mode trigger in which the pull/release operating function is achieved electronically.

The above-described devices either require practice to use reliably, are complex, and/or are expensive to manufacture and install.

Another device for increasing the rate of semiautomatic fire is shown in U.S. Pat. Nos. 9,568,264; 9,816,772; and U.S. Pat. No. 9,939,221, issued to Thomas Allen Graves. The devices shown in these patents forcefully reset the trigger with rigid mechanical contact between the trigger member and the bolt as the action cycles. This invention, however, does not provide a "drop-in" solution for existing popular firearm platforms, like the AR15, AK47 variants, or the Ruger 10/22™. To adapt this invention to an AR-pattern firearm, for example, would require not only a modified fire control mechanism, but also a modified bolt carrier.

SUMMARY OF INVENTION

The present invention provides a semiautomatic trigger mechanism for increasing rate of fire that can be retrofitted into popular existing firearm platforms. In particular, this invention provides a trigger mechanism that can be used in AR-pattern firearms with an otherwise standard M16-pattern bolt carrier assembly. The present invention is particularly adaptable for construction as a "drop-in" replacement trigger module that only requires insertion of two assembly pins and the safety selector. In the disclosed embodiments, the normal resetting of the hammer, as the bolt or bolt carrier is cycled, causes the trigger to be forcibly reset by contact between the hammer and a surface of the trigger member. Once reset, movement of the trigger is blocked by a locking bar and cannot be pulled until the bolt has returned to battery, thus preventing "hammer follow" behind the bolt or bolt carrier.

Other aspects, features, benefits, and advantages of the present invention will become apparent to a person of skill in the art from the detailed description of various embodiments with reference to the accompanying drawing figures, all of which comprise part of the disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

Like reference numerals are used to indicate like parts throughout the various drawing figures; wherein;

FIG. **1** is an isometric view of a drop-in trigger module for an AR-pattern firearm according to one embodiment of the invention;

FIG. **2** is a partially cut-away view thereof;

FIG. **3** is a longitudinal section view showing the module of the embodiment installed in a typical AR15-pattern lower receiver in a cocked and ready to fire status with the bolt and bolt carrier in an in-battery position;

FIG. **4** is a similar view in which the trigger has been pulled and the hammer has fallen against a firing pin; and

FIG. **5** is a similar view showing the bolt carrier in a retracted position, forcing the hammer and trigger into a reset status.

DETAILED DESCRIPTION

With reference to the drawing figures, this section describes particular embodiments and their detailed construction and operation. Throughout the specification, reference to "one embodiment," "an embodiment," or "some embodiments" means that a particular described feature, structure, or characteristic may be included in at least one embodiment. Thus, appearances of the phrases "in one embodiment," "in an embodiment," or "in some embodiments" in various places throughout this specification are not necessarily all referring to the same embodiment. Furthermore, the described features, structures, and characteristics may be combined in any suitable manner in one or more embodiments. In view of the disclosure herein, those skilled in the art will recognize that the various embodiments can be practiced without one or more of the specific details or with other methods, components, materials, or the like. In some instances, well-known structures, materials, or operations are not shown or not described in detail to avoid obscuring aspects of the embodiments.

Referring first to FIGS. **1** and **2**, therein is shown at **10** a "drop-in" trigger module adapted for use in an AR-pattern firearm according to a first embodiment of the present invention. As used herein, "AR-pattern" firearm includes the semiautomatic versions of the AR10 and AR15 firearms and variants thereof of any caliber, including pistol caliber carbines or pistols using a blow-back bolt. While select fire (fully automatic capable) versions of this platform, such as the M16 and M4, are also AR-pattern firearms, this invention only relates to semiautomatic firearm actions. The concepts of this invention may be adaptable to other popular semiautomatics firearm platforms, such as the Ruger 10/22™ or AK-pattern variants.

The module **10** includes a frame or housing **12** that may be sized and shaped to fit within the internal fire control mechanism pocket of an AR-pattern lower receiver. It includes first and second pairs of aligned openings **14**, **16** that are located to receive transverse pins (**40**, **36**, respectively, shown in FIGS. **3-5**) used in a standard AR-pattern trigger mechanism as pivot axes for the hammer and trigger member, respectively. The housing **12** includes left and right sidewalls **20**, **22**, which extend substantially vertically and parallel to one another in a laterally spaced-apart relationship. The sidewalls **20**, **22** may be interconnected at the bottom of the housing **12** at the front by a crossmember **24**.

A hammer **18** of ordinary (MIL-SPEC) AR-pattern shape and construction may be used. The illustrated hammer **18** may be standard in all respects and biased by a typical AR-pattern hammer spring (not shown).

A modified trigger member **26** may be sized to fit between the sidewalls **20**, **22** of the housing **12** and may include a trigger blade portion **28** that extends downwardly. The trigger blade portion **28** is the part of the trigger member **26** contacted by a user's finger to actuate the trigger mechanism. The trigger blade portion **28** may be curved (shown) or straight, as desired. The trigger member **26** may pivot on a transverse pin **36** (not shown in FIGS. **1** and **2**) that extends through aligned openings **16** in the sidewalls **20**, **22** of the housing **12**. The same pin **36** is aligned and positioned within aligned openings **47** of a lower receiver **50** to assemble the module **10** into a fire control mechanism pocket **49** of the lower receiver **50**, as shown in FIGS. **3-5**, for example. The modified trigger member **26** may have integral first and second contact surfaces **30**, **32**. Some part of the trigger member **26** includes contact surfaces for interaction with the hammer **18** and locking bar **62**. For example, the trigger member **26** can include first and second upwardly extended rear contact surfaces **30**, **32**. The first contact surface **30** is positioned to interact, for example, with a tail portion **44** of the hammer **18** that extends rearwardly from a head part **42** of the hammer **18**. The second contact surface **32** is positioned to interact with a locking bar **62**. The contact surfaces may be integral to a specially formed trigger body or may be a separate insert (shown) that is made to closely fit and mate with a standard AR-pattern trigger member, held in place by the trigger pin **36**, with no lost motion between the parts.

The hammer **18** may include bosses **34** coaxial with a transverse pivot pin opening **38** that receives an assembly/pivot pin **40** (not shown in FIGS. **1** and **2**) through the first set of aligned openings **14** in the housing **12** (and through openings **51** in the firearm receiver, to position the trigger module **10** within the fire control mechanism pocket **49** of the lower receiver **50**, as shown in FIGS. **3-5**). The bosses **34** may fit between the sidewalls **20**, **22** of the housing **12** to laterally position the hammer **18**, or can be received in the openings **14** (if enlarged) so that the hammer **18** stays assembled with the module **10** when the hammer's pivot pin is removed and/or when the module **10** is not installed in a firearm receiver. The hammer **18** includes a head portion **42** and a tail portion **44**. The hammer **18** also includes a sear catch **46** that engages the sear **48** on the trigger member **26**, when cocked. The trigger and hammer pins **36**, **40** provide pivot axes at locations (openings **47**, **51**, shown in FIGS. **3-5**, for example) standard for an AR-pattern fire control mechanism. Although FIGS. **3-5** are a longitudinal section view and only show one of the aligned openings **47**, **51**, it is understood that a typical AR15-pattern lower receiver **50** includes second, corresponding and aligned openings **47**, **51** in the half of the receiver **50** not shown).

Referring now also to FIG. **3**, the trigger module **10** is shown installed in the fire control mechanism pocket **49** of an AR-pattern lower receiver **50**. Other lower receiver parts not important to the present invention are well-known in the art and are omitted from all figures for clarity. As is well-known in the art, the bolt carrier assembly **52** (or blow-back bolt) would be carried by an upper receiver (not shown) and engage the breach of a barrel or barrel extension. As used herein, "bolt carrier" and "bolt carrier assembly" may be used interchangeably and include a blow-back type bolt used in pistol caliber carbine configurations of the AR-platform. The hammer **18** is shown in a cocked position and a bolt carrier assembly **52** is shown in an in-battery position. The sear **48** engages the sear catch **46** of the hammer **18**.

The bolt carrier assembly **52** used with the embodiments of this invention can be an ordinary (mil-spec) M16-pattern bolt carrier assembly, whether operated by direct impingement or a gas piston system, that has a bottom cut position to engage an auto sear in a fully automatic configuration. The bottom cut creates an engagement surface **54** in a tail portion **56** of the bolt carrier body **58**. This is distinct from a modified AR15 bolt carrier that is further cut-away so that engagement with an auto sear is impossible. The semiautomatic AR-pattern safety selector switch **60** may also be standard (MIL-SPEC) in all respects.

The trigger module of the present invention includes a trigger locking bar **62** carried on a frame **66** for pivotal movement on a transverse pivot pin **68**. The frame **66** may be part of the module housing **12**, if configured as a "drop-in" unit. An upper end of the locking bar **62** extends above the upper edge of the housing **12** and lower receiver **50** to be engaged by the engagement surface **54** of the bolt

carrier body **58** when the bolt carrier assembly **52** is at or near its in-battery position (as shown in FIG. **3**). Contact between the engagement surface **54** and upper end of the locking bar **62** causes the locking bar **62** to pivot into a first position (FIG. **3**) against a biasing spring **70** and allows pivotal movement of the trigger member **26**. If desired, the locking bar **62** may include a rearward extension **64** that serves as a means to limit the extent to which it can pivot toward the blocking position.

Referring now also to FIG. **4**, when the safety selector **60** is in the "fire" position (as shown in all figures), finger pressure pulling rearward against the trigger blade portion **28** causes the trigger member **26** to rotate on the pivot pin **36**, as indicated by arrows. This rotation causes the sear **48** to disengage from the sear catch **46** of the hammer **18**. This release allows the hammer **18** to rotate by spring force (hammer spring omitted for clarity) into contact with the firing pin **72**. Any contact between the rear portion of the trigger member **26** and front surface of the locking bar **62** will simply cause the locking bar **62** to rotate out of the way, as illustrated in FIG. **4**.

Referring now to FIG. **5**, discharging an ammunition cartridge (not shown) causes the action to cycle by moving the bolt carrier assembly **52** rearwardly, as illustrated. The same effect occurs when the action is cycled manually. As in an ordinary AR15-pattern configuration, a lower surface **76** of the bolt carrier body **58** pushes rearwardly against the head portion **42** of the hammer **18**, forcing it to pivot on the hammer pivot/assembly pin **40** against its spring (not shown) toward a reset position. As the rearward movement of the bolt carrier body **58** and pivotal movement of the hammer **18** continues, mechanical interference or contact between a rear surface **74** of the hammer **18** (such as on the tail portion **44**) and a contact surface **30** of the trigger member **26** forces the trigger to pivot (arrows in FIG. **5**) toward and to its reset position. At the same time, as the trigger member **26** is reset, the biasing spring **70** moves the lower end of the locking bar **62** into a second position (FIG. **5**) in which it blocks pivotal movement of the trigger **26**, including by finger pressure applied (or reapplied) to the trigger blade **28**. Thus, as the bolt carrier assembly **52** returns forward, the trigger member **26** is held in its reset position by the locking bar **62** where the hammer sear catch **46** will engage with the sear **48** carried on the trigger member **26** to reset the fire control mechanism. The trigger member **26** cannot be pulled to release the sear/hammer engagement, thus precluding early hammer release or "hammer follow" against the bolt carrier assembly **52** and firing pin **72** as the bolt carrier assembly **52** is returning to battery. A trigger return spring (not shown) of the type used in a standard AR-pattern trigger mechanism may be unnecessary in this case, because the trigger member **26** is forced to return by the hammer **18**, but may be used, if desired.

When the bolt carrier assembly **52** has reached (or nearly reached) its closed, in-battery position (shown in FIG. **3**), the engagement surface **54** of the bolt carrier tail portion **56** contacts and forwardly displaces the upper end of the locking bar **62**, disengaging the second contact surface **32** of the trigger member **26**, allowing the trigger **26** to be pulled a second time. The distance of travel during which there is no interference between the locking bar **62** and second contact surface **32** of the trigger member **26**, allowing the trigger member **26** to be manually displaced, may be about from about 0.10 to 0.31 inch. This prevents early release of the hammer **18** and contact of the hammer against the firing pin **72** before the bolt is completely locked and in-battery.

Force applied by the user's trigger finger against the trigger blade portion **28** is incapable of overcoming the mechanical interference and force of the hammer **18** against the contact surface **30** of the trigger member **26**. However, the trigger can immediately be pulled again—only by application of an external force—as soon as the locking bar **62** has been rotated against the spring **70** and out of blocking engagement with the trigger member **26**, as the bolt carrier assembly **52** approaches or reaches its in-battery position. This allows the highest possible standard rate of fire, without risk of hammer-follow, for the semiautomatic action of the firearm.

While various embodiments of the present invention have been described in detail, it should be apparent that modifications and variations thereto are possible, all of which fall within the true spirit and scope of the invention. Therefore, the foregoing is intended only to be illustrative of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not intended to limit the invention to the exact construction and operation shown and described. Accordingly, all suitable modifications and equivalents may be included and considered to fall within the scope of the invention, defined by the following claim or claims.

What is claimed is:

1. For a firearm having a receiver with a fire control mechanism pocket, transversely aligned pairs of hammer and trigger pin openings in side walls of the pocket, and a bolt carrier that reciprocates and pivotally displaces a hammer when cycled, a trigger mechanism, comprising:

a hammer having a sear notch and mounted in the fire control mechanism pocket to pivot on a transverse hammer pin between set and released positions;

a trigger member having a sear and mounted in the fire control mechanism pocket to pivot on a transverse trigger pin between set and released positions, the trigger member having a surface positioned to be contacted by the hammer when the hammer is displaced by cycling of the bolt carrier, the contact causing the trigger member to be forced to the set position;

a locking bar pivotally mounted in a frame and spring biased toward a first position in which the locking bar mechanically blocks the trigger member from moving to the released position, and movable against the spring bias to a second position when contacted by the bolt carrier reaching a substantially in-battery position, allowing the trigger member to be moved by an external force to the released position.

2. The trigger mechanism of claim **1**, wherein the trigger member has a second surface positioned to be contacted by the locking bar when the locking bar is in the first position.

3. The trigger mechanism of claim **1**, wherein the locking bar includes means for limiting the extent to which the locking bar can pivot by the spring bias toward the first position.

4. For a firearm having a receiver with a fire control mechanism pocket, assembly pin openings in side walls of the pocket, and a bolt carrier that reciprocates and pivotally displaces a hammer when cycled, a trigger mechanism, comprising:

a housing having transversely aligned pairs of openings for receiving hammer and trigger assembly pins;

a hammer having a sear notch and mounted in the housing to pivot on a transverse axis between set and released positions;

a trigger member having a sear and mounted in the housing to pivot on a transverse axis between set and

released positions, the trigger member having a surface positioned to be contacted by the hammer when the hammer is displaced by the bolt carrier when cycled, the contact causing the trigger member to be forced to the set position;

a locking bar pivotally mounted in the housing and spring biased toward a first position in which the locking bar mechanically blocks the trigger member from moving to the released position, and movable against the spring bias to a second position when contacted by the bolt carrier reaching a substantially in-battery position in which the trigger member can be moved by an external force to the released position.

5. The trigger mechanism of claim **4**, wherein the trigger member has a second surface positioned to be contacted by the locking bar when the locking bar is in the first position.

6. The trigger mechanism of claim **4**, wherein the housing's transversely aligned pairs of openings for receiving hammer and trigger assembly pins are aligned with the assembly pin openings in the fire control mechanism pocket of the receiver.

7. The trigger mechanism of claim **4**, wherein the locking bar includes means for limiting the extent to which the locking bar can pivot by the spring bias toward the first position.

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